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NATIONAL DAM INSPECTION PROGRAM. VILLAGE TWO AT NEW HOPE DAM (N--ETC(U)
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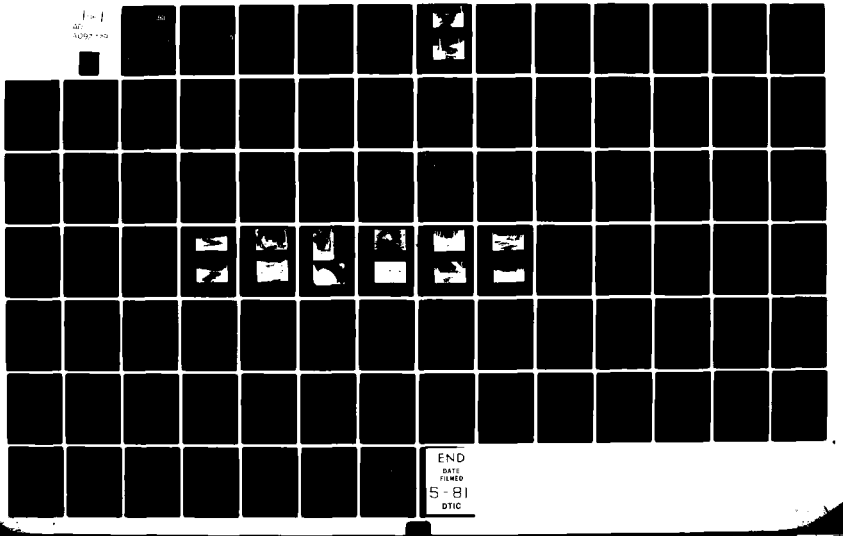

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DEL WARE RIVER BASIN
UNNAMED TRIBUTARY OF DELAWARE RIVER
PENNSYLVANIA

NDI ID PA-00803

PA DER 9-173

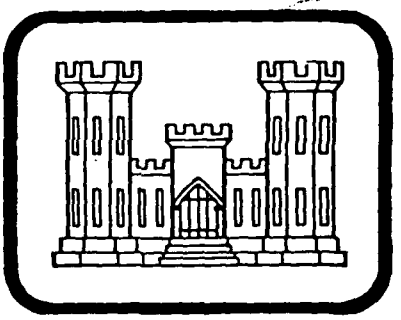
LEVEL II

VILLAGE TWO AT NEW HOPE DAM

OWNED BY

CITIBANK

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS

BALTIMORE, MARYLAND
21203

BY

O'BRIEN & GERE

PHILADELPHIA, PENNSYLVANIA
19103

FEBRUARY 1981

DELAWARE RIVER BASIN

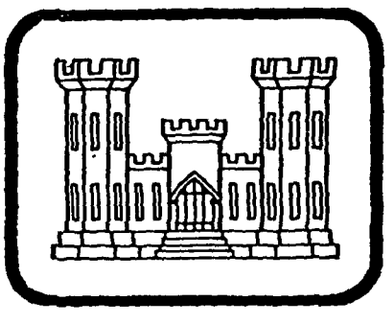
National Dam Inspection Program.

VILLAGE TWO AT NEW HOPE DAM (NDI ID ~~PENNSYLVANIA~~ PA-00803, PADER 9-173), Delaware River Basin, Unnamed Tributary of Delaware River, Pennsylvania.

NDI I.D. ~~PA-00803~~

OWNED BY
CITIBANK

PHASE I INSPECTION REPORT
NATIONAL ~~DAM~~ INSPECTION PROGRAM



Prepared for:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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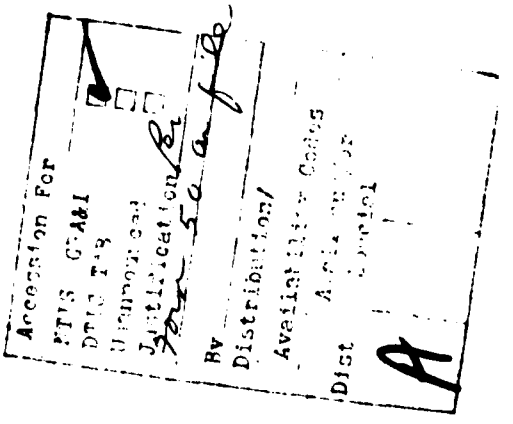
PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Village Two at New Hope Dam
State Located:	Pennsylvania
County Located:	Bucks County
Stream:	Unnamed tributary of Delaware River
Coordinates:	Latitude N 40° 21.5', Longitude W 74° 57.3'
Date of Inspection:	December 15, 1980

ASSESSMENT

Village Two at New Hope Dam is a zoned earth embankment approximately 300 feet long with a maximum height of 34 feet which impounds a reservoir with a normal pool storage capacity of 14 acre-feet. The top of dam elevation varies 25 feet from El. 192 at the left abutment to El. 167 at the right abutment. The top width varies with the average width being about 40 feet. The normal overflow spillway consists of a 36-inch diameter steel riser pipe, 21 feet long, feeding into a 30-inch diameter steel pipe through the base of the embankment which outlets downstream of the dam. The emergency overflow spillway consists of a reinforced concrete overflow inlet structure and a 48-inch diameter reinforced concrete discharge pipe constructed through the dam and outletting on the downstream abutment close to the downstream embankment face. The dam is located at New Hope, Pennsylvania, about 0.25 miles west of the Delaware Canal.

The Spillway Design Flood (SDF) chosen for this "Small" size, "High" hazard dam is 50 percent of the Probable Maximum Flood (PMF). The spillways are capable of discharging 29 percent of the PMF without overtopping of the embankment. However, a dam breach with 50 percent of the PMF will only increase the water surface elevation at the downstream hazard area by 0.9 feet. Therefore, the spillways are classified as "Inadequate", but not "Seriously Inadequate".

Based on the visual observations and review of the information obtained from the Pennsylvania Department of Environmental Resources, Division of Dam Safety, and from Van Note-Harvey Associates, Princeton, New Jersey, Village Two at New Hope Dam is considered to be in fair condition.

Recommendations and Remedial Measures are as follows:

The following recommendations and remedial measures should be initiated immediately. The Owner should retain the services of a licensed professional engineer experienced in the design and construction of dams to assist in complying with these recommendations and remedial measures.

a. Facilities.

1. The right side of the embankment should be built up to the design top of dam Elev. 170 and both the upstream and downstream faces of the embankment

should be constructed as shown on the design drawings. A hydrologic and hydraulic analysis (Appendix D) indicates that by increasing the minimum crest of the dam to Elev. 170.0 the spillway capacity would be increased to approximately 60 percent of the PMF.

2. An investigation should be made of the source and nature of the seepage observed along the downstream face of the dam and abutment junction below Elev. 145 around the outlet of the 30-inch diameter normal outlet pipe and beneath the outlet of the emergency overflow outlet pipe. Appropriate action should follow the investigations.

3. The embankment should be cleared of all trees and brush and any resulting voids should be backfilled with suitable compacted material. A grass cover should be established and maintained on the reconstructed slopes and crest of the dam.

4. Provisions should be made to ensure that discharge from the 48-inch diameter emergency overflow spillway outlet pipe will not damage the downstream embankment. Repairs should be made to the connection of this pipe into the downstream wall of the emergency overflow spillway inlet structure.

5. Boulders should be removed from the embankment surface and consideration should be given to protection of the upstream embankment face against wave action.

6. A trash rack should be provided on the emergency overflow spillway inlet structure as specified in the design. At least half of the steel rods should be removed from the trash rack on the normal overflow spillway riser pipe.

7. The reservoir drain gate valve at the bottom of the normal overflow riser pipe should be inspected and repaired if necessary.

b. Operation and Maintenance Procedures

1. A regular inspection and maintenance program should be developed and implemented. This program should include periodic operation of the reservoir drain gate valve of the normal overflow structure.

2. A system of warning downstream residents living along the east bank of the Delaware Canal in the event of an impending dam failure should be developed.

O'BRIEN & GERE ENGINEERS, INC.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL JOHN J. WILLIAMS ENGINEER No. 6920-E

John J. Williams

Date: 19 FEB. 1981

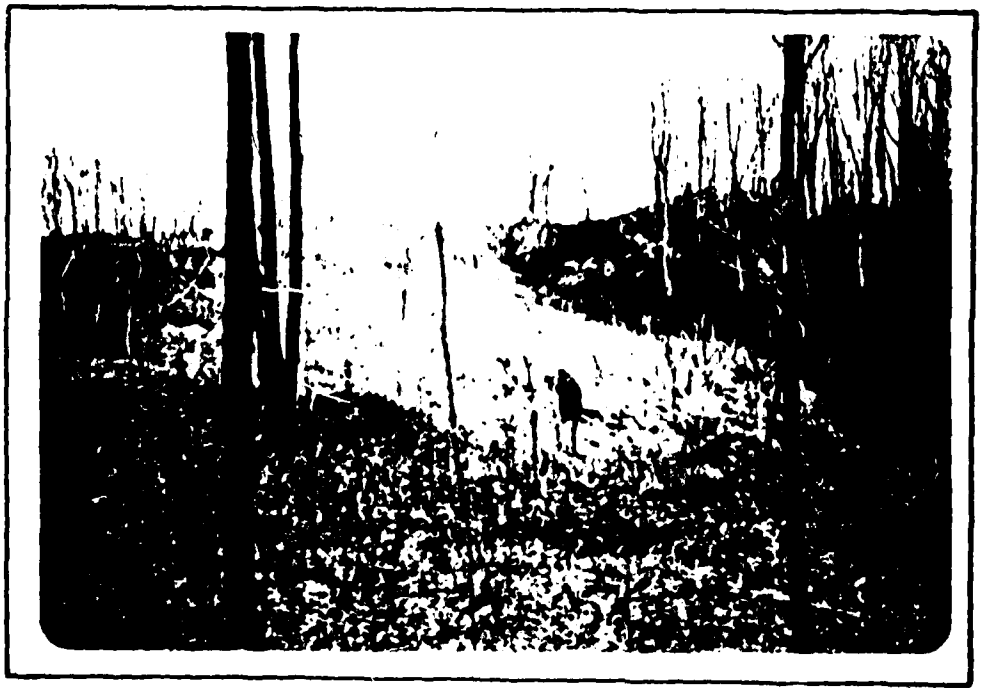
John J. Williams, P.E.
Vice President
Pennsylvania Registration No. PE006920-E

James W. Peck

Date: 4 MARCH 81

Approved
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

UPSTREAM OVERVIEW FROM THE RIGHT ABUTMENT.



DOWNSTREAM OVERVIEW FROM THE RIGHT ABUTMENT.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
VILLAGE TWO AT NEW HOPE DAM
NDI ID NO. PA-00803

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if Village Two at New Hope Dam constitutes a hazard to human life or property.

1.2 Description of Project (The description is based upon information obtained from the Pennsylvania Department of Environmental Resources (DER), Division of Dam Safety, Harrisburg, Pennsylvania, Van Note-Harvey Associates, Princeton, New Jersey and from this inspection.)

a. Dam and Appurtenances. According to the design drawings (Appendix E) of Van Note-Harvey Associates, Village Two at New Hope was to have been a zoned earth embankment approximately 370 feet long with a maximum height of 37 feet. However, upon inspection the length and maximum height were found to be 300 feet and 34 feet, respectively. The top of the dam was to be 65 feet wide with the dam crest at Elev. 170, but the inspection revealed it to average only about 40 feet in width with a crest elevation that varied from Elev. 192 at the north abutment to Elev. 167.1 at the south abutment. The upstream and downstream faces of the embankment were to have been constructed on slopes of 3H:1V and protected by riprap. Both slopes are steeper than this (about 2H:1V) and have no riprap protection.

The embankment was to have been constructed in two zones. The core material was to have been a clean inorganic clay soil (70% clay by volume) protected with a decomposed shale, shale and random rock shell.

A normal overflow spillway is located at the approximate midpoint of the dam. The intake structure consists of a 36-inch diameter steel riser about 21 feet high which is constructed to normal pool Elev. 164.5. It has a steel rod trash rack and was to have been fitted with a steel anti-vortex plate which was not in place at the time of the inspection. A 30-inch diameter extra strength steel pipe is constructed from the base at riser Elev. 143.5, extends through the embankment and outlets into the discharge channel at Elev. 133.0. The joint between the riser and the discharge pipe and all joints in the discharge pipe are welded. The base of the riser is encased in concrete. The 30-inch diameter pipe is 210 feet long and placed on a five percent slope. Five foot square steel anti-seep collars are welded to the 30-inch diameter

pipe at 18-foot maximum spacings. An 8-inch diameter gate valve used to control flow through the reservoir drain is located at the base of the riser. The gate valve stem was to have been extended to the top of riser; however, it was not observed during the inspection.

An emergency overflow spillway is constructed near the right abutment. The inlet structure consists of a reinforced concrete drop box intake structure with a weir length of 40 feet (30 feet parallel to the dam axis and five feet on each side perpendicular to the axis of the dam). The weir crest elevation is 166.5 while the downstream wall of the structure is constructed two feet higher to support an aluminum trashrack which was not in place at the time of the inspection. A 48-inch diameter reinforced concrete discharge pipe is connected at the invert of the intake structure, Elev. 161.5. The reinforced concrete pipe is 100 feet long and placed on a slope of three percent. The pipe was to have been placed on undisturbed earth and projects from the abutment at approximately Elev. 158.5. Discharge from the reinforced concrete pipe was to have been directed to the downstream channel through a trapezoidal rock lined channel, but the channel was not observed at the time of the inspection.

The crest width of the dam was to have been designed to accommodate a 31-foot wide roadway. Surface drainage from the roadway was to be diverted to the emergency spillway reinforced concrete pipe through two inlets located near the right abutment, but these inlets were never installed.

b. Location. Village Two at New Hope Dam is located on an unnamed tributary of the Delaware River in New Hope Borough, Bucks County, Pennsylvania. The dam site is located on the USGS Quadrangle entitled "Lambertville-PA-NJ" at coordinates N 40° 21.5', W 74°, 57.3'. A regional vicinity map is included as Figure 1, Appendix E.

c. Size Classification. The maximum height of the dam is about 34 feet and reservoir storage to the low point of the top of the dam is approximately 20 acre-feet. Accordingly, the dam size is classified as "Small", because it is less than 40 feet high and has a maximum storage capacity of less than 1,000 acre-feet.

d. Hazard Classification. Village Two at New Hope Dam is a "High" hazard structure because of more than a dozen houses and commercial establishments about 0.25 miles downstream of the dam immediately to the east of the Delaware Canal. The east bank of the canal is only about two feet above the water surface.

e. Ownership. Village Two at New Hope is in bankruptcy. The dam is now owned by Citibank. Correspondence should be addressed Citibank, New York, New York, Attention: Mr. John Williams

f. Purpose of Dam. The dam was constructed to control runoff, sediment control and to improve the aesthetics of the site. The embankment is also the roadbed for a proposed roadway.

g. Design and Construction History. Based on available information, construction on the dam began in 1972. No application for a permit had been filed by

the Owners. In November 1972, the project was inspected by the Commonwealth of Pennsylvania, DER, Division of Dams and Encroachments and construction was stopped due to the lack of a permit. At the time, a significant portion of the embankment and the normal overflow spillway steel pipe were in place.

The Owners were directed to submit an application for a permit to construct a dam. This directive was complied with in December 1972 when a set of design drawings, and Engineering Report and Specifications were submitted to DER. An apparent revision made as a result of the application review was to change the upstream slope from 2H:1V to 3H:1V.

The permit for construction was issued in April 1973 and Van Note-Harvey Associates (the Engineer) notified DER in January 1974 that construction was again in progress. The construction during the winter months was reported to be limited to placing "excavated rock in back of the existing dam and preparation for full scale operations when the weather and field conditions are more suitable". In October 1974, the Engineer notified DER that the 48-inch emergency overflow spillway pipe had been put in place and that no other work had been done since January 1974.

In February 1976, the Owners informed DER that they had "instructed our Engineers to prepare as built drawings and other documents necessary to certify completion of the dam". In March 1976, the Engineers advised DER that they would not certify completion until "the work was completed as specified and some of the completed work repaired".

No other information relative to the construction history of the dam is available. In the last available correspondence, DER authorized extension of the construction permit to December 31, 1980.

h. Normal Operating Procedures. There are no restraints to flow through the spillways. It appears that the reservoir drain is in the closed position. No daily releases are made for downstream low flow augmentation.

1.3 Pertinent Data

a. Drainage Area (Acres) — 90

b. Discharge at Dam Site (CFS)

Maximum known flood at site	Unknown
At Emergency Spillway Crest, El. 166.5	80
At Existing Low Point Top of Dam, El. 167.1	185
At Design Top of Dam, El. 170.0	1965

c. Elevations (MSL)

Top of Dam, Design	170.0
Top of Dam, Low Point Existing	167.1
Normal Overflow Spillway Crest	164.5
Invert Normal Overflow Spillway Riser	143.5

Invert Normal Overflow Spillway Outlet	133.0
Emergency Overflow Spillway Inlet Box Crest	166.5
Streambed at Downstream Toe of Dam	133.0

d. Reservoir Length (Feet)

Normal Pool, Elev. 164.5	600
Top of Dam, Low Point, Elev. 167.1	715

e. Reservoir Storage (Acre-Feet)

Normal Pool, Elev. 164.5	14.0
Top of Dam, Low Point, Elev. 167.1	20.0

f. Reservoir Surface (Acres)

Normal Pool, Elev. 164.5	2.1
Top of Dam, Low Point, Elev. 167.1	2.6

g. Dam Data

Type	Zoned Earth Embankment
Length	300 Feet
Height (to low point top of dam, El. 167)	34 Feet
Top Width	Averages 40 Feet
Side Slopes	Average 2H:1V upstream and downstream
Zoning	Clay core with outer rock shells
Cutoff	To bedrock
Grout Curtain	None

h. Diversion System — None

i. Spillway

1. Normal Overflow Spillway (Refer to Sheets 3 and 4 Appendix E)

Inlet Type	Drop inlet, 21 feet high, 36-inch diameter steel riser pipe with steel rod trash rack.
Pipe Length and Size	210 feet long, 30-inch diameter steel pipe through base of embankment
Control	None
Energy Dissipator	Concrete headwall at downstream end of pipe and riprap channel protection for about 20 feet
Downstream Channel	Natural stream channel downstream of the riprap protection.

2. Emergency Overflow Spillway (Refer to Sheets 3 and 4 Appendix E)

Inlet Type	Concrete drop box inlet, weir 40 feet long, box 5 feet deep.
Pipe Length and Size	100 feet long, 48-inch diameter reinforced concrete pipe through embankment.
Control	None
Energy Dissipator	Flow from the 48-inch diameter reinforced concrete pipe is discharged onto the downstream abutment.

j. Outlet Works — 8-inch diameter steel pipe drain extends into the reservoir and terminates at base of riser. The gate valve is inaccessible and valve stem is missing. No trashrack is shown on the design drawings at intake in the reservoir.

SECTION 2

ENGINEERING DATA

2.1 Design

a. Data Available. The information available in the DER main office files in Harrisburg, PA for review of Village Two at New Hope Dam includes the following:

1. "Application", "Report on the Application", and "Permit" to construct Village Two at New Hope Dam.

2. Complete set of design drawings.

3. Inspection reports November 16, 1972, and February 27, 1973.

4. Miscellaneous correspondence, memoranda, etc.

b. Design Features. The design features are described in Section 1.2.a and shown on sheets 2 through 4 of Appendix E.

2.2 Construction

Based on the field investigation and the information available from DER, the dam appears to have not been constructed in conformance with the design drawings. No information is available relative to the construction of the dam.

2.3 Operation

Operational procedures consist of opening or closing the 8-inch diameter reservoir drain gate valve inside at the base of the 36-inch diameter normal overflow inlet riser. According to the Owner's representative, it is not known if the gate valve is operational.

2.4 Evaluation

a. Availability. All engineering data including the complete set of design drawings were provided by DER.

b. Adequacy. The information provided by DER, visual observations and Mr. Wayne Patterson, the Owner's representative, is considered adequate for a Phase I investigation.

c. Validity. There appears to be no reason to question the validity of the information obtained from DER.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Village Two at New Hope Dam took place on December 15, 1980. At the time of inspection, the water surface was approximately 1.5 feet below the normal overflow spillway riser crest. The observations and comments of the field inspection team are in the checklist which is Appendix A of this report. The appearance of the facility indicates that the dam and its appurtenances are poorly maintained.

b. Dam. The slope of the upstream face of the dam is very irregular. Small trees (up to 4-inch diameter trunks) and thick brush cover most of the upstream and downstream faces of the dam.

The riprap on the downstream face of the dam is randomly placed and ranges in size from four inch rock to about five foot boulders. Seepage (2 gpm in each case) was observed at the left and right embankment and abutment junctions below El. 145 and around the 30-inch normal overflow spillway outlet pipe. Seepage (5 gpm) was also observed flowing from beneath the outlet end of the 4-foot diameter emergency overflow spillway outlet pipe. Fines are apparent in the seepage flow which may indicate piping of soil particles from the embankment.

The top of the dam at the left abutment is 25 feet higher than the top of the dam at the right abutment. This was done to accommodate a dirt road along the dam crest; however, at the right abutment the top of dam is about 3 feet below design El. 170. The horizontal alignment of the dam axis appears to be satisfactory but the width of the dam crest varies considerably with the width averaging about 40 feet. The crest of the dam is essentially a dirt road with no vegetative cover.

c. Appurtenant Structures. The 36-inch diameter steel riser pipe of the normal overflow spillway appears to be in good condition. Steel rods on the trash rack are too closely spaced, thus discharge would be impeded because of trash build-up. The 8-inch diameter gate valve could not be examined because it is at the base of the 21-foot intake tower. The trash rack must be removed to gain access to the intake riser. No valve stem was observed. The 30-inch diameter steel outlet pipe and the outlet channel appear to be in satisfactory condition.

Small trees (up to 4-inch diameter trunks) and brush obstruct flow to the emergency overflow spillway inlet structure. The emergency overflow inlet structure appears to be in good condition except for some honeycombing observed in the concrete. Gaps were left around the perimeter of the 48-inch diameter reinforced concrete outlet pipe where it joins the downstream wall of the inlet structure (see Appendix C, Photographs No. 6). The invert of the four foot outlet pipe is about 26 feet above the valley floor where it outlets on the right abutment downstream within a few feet of the downstream face of the dam. Discharge from the emergency overflow spillway outlet pipe would tend to erode the downstream

face of the dam. The discharge channel is obstructed with brush, small trees and boulders.

d. Reservoir. Area reconnaissance of the reservoir disclosed no evidence of sedimentation, slope instability or other features that would significantly affect the storage capacity of the reservoir. Slopes along the perimeter of the reservoir average about 4H:1V with grass, brush and tree coverage. Very limited areas are not covered with vegetation.

e. Downstream Channel. The downstream channel flows through a narrow, wooded valley. Some fallen timber obstructs the discharge. The channel invert slope averages about 4 percent. Side slopes of the channel average about 2½:1V.

Approximately a dozen houses and commercial establishments, immediately downstream from the Delaware Canal (sheet 2, Appendix E), which is about 0.25 miles downstream from the dam, would be directly affected by a failure of the dam.

3.2 Evaluation. Based on the visual inspection, the Village Two at New Hope Dam and its appurtenances appear to be in fair condition; however, lack of continuous maintenance could to lead to serious problems.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedures

The operational procedures would consist of opening or closing the 8-inch diameter reservoir drain gate valve inside at the base of the 36-inch diameter normal overflow spillway riser. The Owner's representative does not know if the gate valve is operational.

4.2 Maintenance of the Dam

According to the Owner's representative, no maintenance is presently performed on the dam.

4.3 Maintenance of Operating Facilities.

According to the Owner's representative, the gate valve is not operated on a regular basis. The gate valve was inaccessible for observation during the inspection because the valve is located inside at the base of the 36-inch diameter normal overflow riser. The riser has a closely spaced steel rod trash rack attached to its crest.

4.4 Description of Any Warning Systems in Effect

According to the Owner's representative, no system of warning residents living along the east bank of the Delaware Canal of an impending dam failure is in effect for Village Two at New Hope Dam. The Delaware Canal is about 0.25 mile downstream of the dam. Refer to Sheet 2, Appendix E for layout details of this area.

4.5 Evaluation

The bushes, small trees and debris evident on the entire dam confirm the fact that the dam is not maintained. A regular inspection and maintenance program should be established which would include periodic operation of the reservoir drain gate valve and keeping all obstructions from the entrances to the principal and emergency overflow spillways.

A system of warning downstream residents living along the east bank of the Delaware Canal in the event of an impending dam failure should be developed.

SECTION 5

HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Village Two at New Hope Dam has a drainage area of 0.14 square miles and impounds a reservoir with a normal pool storage capacity of 14 acre-feet. The watershed has a maximum width of about 0.3 miles and a maximum length of about 0.7 miles. The ground surface ranges from El. 300 in the upper reaches of the watershed to Elev. 164.5 at normal pool. The drainage area is generally moderately sloping open areas of weeds or tall grass and some small wooded areas.

The normal overflow spillway inlet structure is a 36-inch diameter riser pipe feeding into a 30-inch diameter steel pipe through the base of the embankment. It has a capacity of 119 cfs when the reservoir pool reaches the low point of the top of the dam (Elev. 167.1). The emergency overflow spillway and 4-foot diameter outlet pipe has a capacity of 66 cfs at water surface Elev. 167.1. The combined capacity of both spillways is 185 cfs at the low point of the top of the dam, Elev. 167.1.

b. Experience Data. According to the Owner's representative, no rainfall or reservoir level records are kept for this dam.

c. Visual Observations. The steel rods on the trash rack of the normal overflow structure are too closely spaced, thus discharge would be impeded due to trash build-up.

No trash rack exists on the emergency overflow spillway inlet structure, therefore it is susceptible to clogging. Small trees (up to 4-inch diameter trunks) and brush obstruct access to the structure. Discharge from the emergency overflow spillway outlet pipe would also be impeded by brush, small trees and boulders.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the HEC-1, Dam Safety Version, computer program. A brief description of the program is included in Appendix D.

According to the Guidelines, the recommended Spillway Design Flood (SDF) for a "Small" size, "High" hazard dam ranges from one-half to the full Probable Maximum Flood (PMF). The dam is in close proximity to a residential and commercial area; however, because of its limited storage capacity of 20 acre-feet at the low point of the top of the dam El. 167.1, the selected SDF is one-half of the full PMF.

Various percentages of the PMF were routed through Village Two at New Hope Dam using HEC-1 program. The peak inflow and outflow rates for the SDF were computed to the 352 cfs and 322 cfs, respectively. Based on the hydrologic and hydraulic analyses, the spillway is capable of discharging approximately 29 percent of the PMF without overtopping the low point of the crest of the embankment (See Appendix C for computations).

e. Spillway Adequacy. For this study, the embankment was assumed to fail with water flowing 0.7 feet over the low point of the top of the dam. A trapezoidal breach was assumed, 150 feet wide at the base, with side slopes of 1H:1V. It was assumed that the breach took two hours to reach its maximum extent. The breach condition was compared to the non-breach condition at the damage center, during identical storms, to assess the increased potential for damage due to dam failure over what might occur with no breach. A review of this analysis indicates that the water surface elevation at the damage center is 0.9 feet higher for the breach condition. The spillway systems are classified as "Inadequate" since they are not capable of passing the SDF; however, they are not classified as "Seriously Inadequate" since breaching of the dam does not significantly increase the downstream hazard potential. A hydrologic and hydraulic analysis (Appendix D) indicates that by increasing the minimum crest of the dam to Elev. 170.0 the spillway capacity would be increased to approximately 60 percent of the PMF.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The top of the dam, which has a variable width averaging about 40 feet, is used as a roadway and contains no vegetative cover. The slopes of the upstream and downstream faces of the embankment are very irregular and contain small trees (up to 4-inch diameter trunks) and thick brush. No riprap is present on the upstream face. The riprap on the downstream face is randomly placed and ranged in size from four inch rock to 5-foot boulders. Seepage (2 gpm in each case) was observed at the downstream embankment, abutment junctions below El. 145 and around the 30-inch diameter normal spillway outlet pipe. Seepage (5 gpm) was observed flowing from beneath the outlet end of the four foot diameter emergency overflow spillway outlet pipe.

The embankment appears to be stable under static loading conditions; however, fines are apparent in the seepage flow which may indicate piping of soil particles from within the embankment. An investigation should be made as to the source and nature of the seepage and appropriate actions should follow.

The invert of the outlet of the emergency overflow spillway four foot diameter outlet pipe is located about 26 feet above the outlet channel near the downstream face of the dam. Discharge from the outlet pipe would flow over the unprotected embankment. The fitting of this pipe into the emergency overflow spillway inlet structure's downstream wall is in poor condition.

b. Design and Construction Data. Design drawings, application data and miscellaneous correspondences were provided by the DER. However, no design calculations were included in the provided information.

c. Operating Records. According to the Owner's representative, no operating records are maintained for this dam.

d. Post Construction Changes. No records are available for any structural changes to the dam subsequent to the termination of construction. It was evident, upon inspection of the dam site, that construction was never completed.

e. Seismic Stability. Village Two at New Hope Dam is located in Seismic Zone 1 on the Seismic Zone Map of Contiguous States. A dam located in Seismic Zone 1 is generally considered to be safe under any expected Zone 1 earthquake loading conditions if it is stable under static loading conditions.

SECTION 7

ASSESSMENT RECOMMENDATIONS AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation. Based on the visual observations and review of the available information, Village Two at New Hope Dam is considered to be in fair condition. Several deficiencies were noted during the inspection. The trash rack is missing on the emergency overflow spillway inlet structure and the bars are too closely spaced on the trash rack of the normal overflow spillway inlet structure. Riprap is needed on the upstream face of the embankment to protect against wave action. The 48-inch diameter emergency overflow spillway outlet pipe discharges too closely to the downstream face of the embankment and seepage (5 gpm) is discharging from beneath the outlet of the pipe. The fitting of this pipe into the emergency overflow spillway inlet structure's downstream wall needs repair. Small trees (up to 4-inch diameter trunks) and brush are growing on both the upstream and downstream faces of the dam. Seepage (2 gpm in each case) is evident below El. 145 on both sides at the abutment, downstream face of dam junction and around the 30-inch diameter outlet pipe. A portion of the top of the dam near the right abutment is below the design elevation by nearly 3 feet. The upstream and downstream faces of the embankment are very irregular. The reservoir drain gate valve at the bottom of the riser pipe of the normal overflow structure is inaccessable and its operability is unknown. Many of the problems are related to the fact that construction of Village Two at New Hope Dam was never completed.

The SDF selected for Village Two at New Hope Dam is 50 percent of the PMF. The spillway is capable of discharging 29 percent of the PMF before the embankment is overtopped. The spillway systems are classified as "Inadequate", but not "Seriously Inadequate" because the water surface elevation at the damage center is only about 0.9 feet higher for the breach condition as compared to the non-breach condition for the same storm event.

b. Adequacy of Information. The information obtained from DER, visual observations and discussions with the Owner's representative are considered adequate for a Phase I investigation.

c. Urgency. The remedial measures recommended in Section 7.2 should be initiated immediately.

d. Necessity for Further Investigation. Further investigation should be implemented as discussed in Section 7.2.

7.2 Recommendations and Remedial Measures

The following recommendations and remedial measures should be initiated immediately. The Owner should retain the services of a licensed professional engineer experienced in the design and construction of dams to assist in complying with these recommendations and remedial measures.

a. Facilities.

1. The right side of the embankment should be built up to the design top of dam Elev. 170 and both the upstream and downstream faces of the embankment should be constructed as shown on the design drawings.

2. An investigation should be made of the source and nature of the seepage observed along the downstream face of the dam and abutment junctions below Elev. 145, around the outlet of the normal overflow spillway pipe and beneath the outlet of the emergency overflow spillway outlet pipe. Appropriate action should follow the investigation.

3. The embankment should be cleared of all trees and brush and any resulting voids should be backfilled with suitable compacted material. A grass cover should be established and maintained on the reconstructed slopes and crest of the dam.

4. Provisions should be made to insure that discharge from the 48-inch diameter emergency overflow spillway outlet pipe will not damage the downstream embankment. Repairs should be made to the connection of this pipe into the downstream wall of the emergency overflow spillway inlet structure.

5. Boulders should be removed from the embankment surface and consideration should given to protection of the upstream embankment face against wave action.

6. A trash rack should be provided on the emergency overflow spillway inlet structure as specified in the design. At least half of the steel rods should be removed from the trash rack on the normal overflow spillway riser pipe.

7. The reservoir drain gate valve at the bottom of the normal overflow riser pipe should be inspected and repaired if necessary.

b. Operation and Maintenance Procedures

1. A regular inspection and maintenance program should be developed and implemented. This program should include periodic operation of the reservoir drain gate valve of the normal overflow structure.

2. A system of warning downstream residents living along the east bank of the Delaware Canal in the event of an impending dam failure should be developed.

APPENDIX A

CHECKLIST
VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam Village Two County Bucks State Pennsylvania NDI ID PA-00803

Type of Dam Earth Embankment Hazard Category High

Date(s) Inspection 12/15/80 Weather Partly cloudy Temperature 30°F

Pool Elevation at Time of Inspection 163.0 M.S.L. Tailwater at Time of Inspection ± 133.0 M.S.L.

Inspection Personnel:

Lee DeHeer

Leonard Beck

Jon Rauschkolb

Lee DeHeer Recorder

Remarks:

Wayne Patterson, Vice President, Van Note-Harvey Associates accompanied us during the inspection.

Sheet 1 of 11

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

Sheet 2 of 11

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

Sheet 3 of 11

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The elevation of the top of the dam at the north abutment is 25ft. higher than the elevation of the top of the dam at the south abutment. This was done to accommodate a road along the dam crest. The horizontal alignment of the dam axis appears to be satisfactory but the width of the dam varies.	The dam should be finished to agree with the section shown on the drawings.
RIPRAP FAILURES	Even though riprap is called for on both the upstream and downstream faces of the dam on the drawings, none was in evidence. Random boulders are scattered over the dam surface.	Riprap should be placed at least on the upstream face of the dam for protection against wave action.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Junction of embankment and abutment appears satisfactory from top of dam to approximately El. 145 on the downstream side. Below El. 145 seepage (2gpm each side) is evident at the junctions of the embankment and abutments on the downstream face. Seepage (5gpm) is also flowing from beneath the outlet end of the 4-foot diameter emergency spillway conduit. Fines are apparent in the seepage flow.	Investigate the source and extent of the seepage.
ANY NOTICEABLE SEEPAGE		
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

Sheet 5 of 11

OUTLET WORKS

(NORMAL OVERFLOW STRUCTURE)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N/A Intake riser and conduit are steel pipes.	
INTAKE STRUCTURE	36-inch diameter riser pipe appears to be in good condition. Steel rods on trash rack are too closely spaced thus discharge would be impeded because of trash buildup. 8-inch drain pipe and gate could not be observed.	Remove some of the steel rods in the trash rack.
OUTLET STRUCTURE	Appears satisfactory	
OUTLET CHANNEL	Appears satisfactory	
EMERGENCY GATE	8-inch diameter gate or valve could not be examined because it is at the base of the 21-foot high intake tower. Steel rod trash rack must be removed to gain access to the intake riser.	Investigate the condition of the gate or valve and the drain pipe.

Sheet 6 of 11

UNGATED SPILLWAY
(EMERGENCY OVERFLOW STRUCTURE)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete appears to be in good condition.	
APPROACH CHANNEL	Small trees(up to 4-inch diameter trunks) and brush obstruct access to the intake structure.	Remove the trees and brush and backfill any resulting voids with suitable compacted material.
DISCHARGE CHANNEL	Channel alignment is very close to the downstream face of the dam. Channel is obstructed with brush, small trees and boulders.	Take corrective measures to insure that discharge will not affect downstream portion of dam.
BRIDGE AND PIERS	N/A	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	None	

Sheet 9 of 11

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes along the perimeter of the reservoir average about 4H:1V and are covered with grass, brush and trees. Very limited areas are not covered with vegetation.	
SEDIMENTATION	No evidence of sedimentation was observed in the impoundment.	

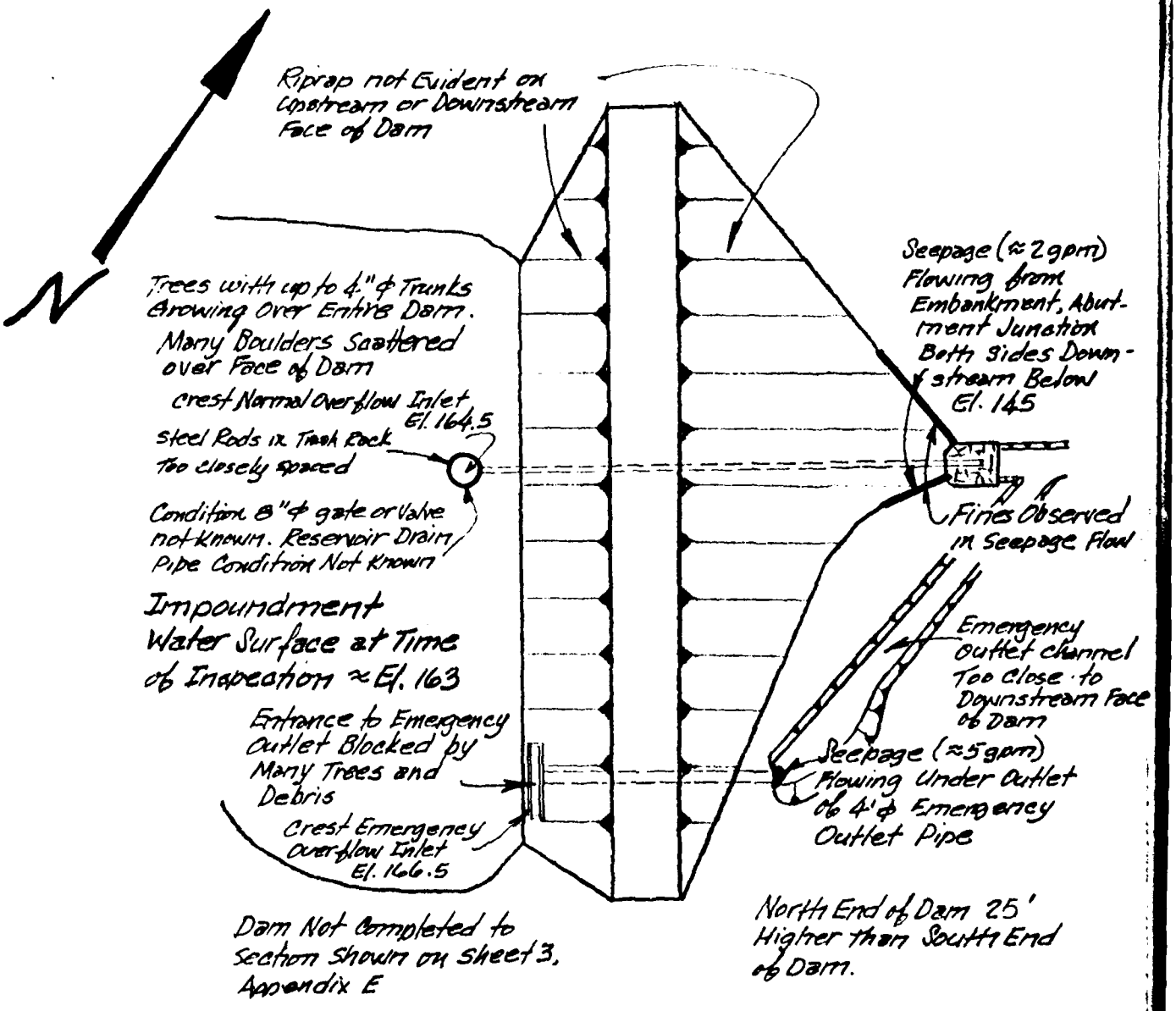
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Channel f ows through narrow wooded valley. Some fallen timber obstructs the discharge.	
SLOPES	Channel invert slope averages about 4 percent. Side slopes of channel average about 2H:1V.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately a dozen homes and commercial establishments immediately downstream from the Delaware Canal(about 0.25 miles downstream from the dam) would be directly affected by a failure of the dam.	Definitely makes the dam "High" hazzard.

Sheet 11 of 11

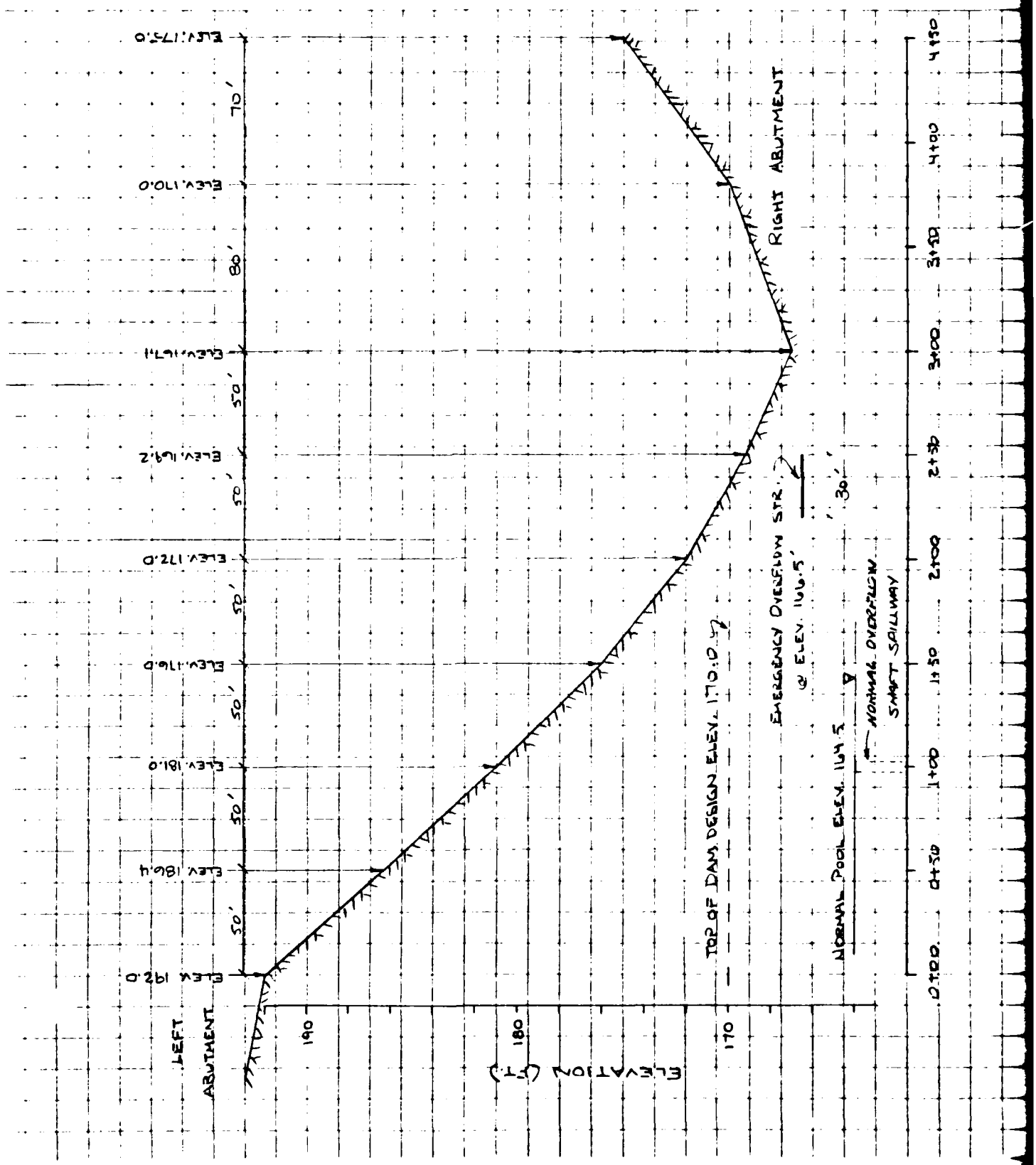
O'BRIEN & GERE
ENGINEERS, INC

SUBJECT	SHEET	BY	DATE	JOB NO
Village Two Pond Dam	11A	EB	1/21/81	1841-014



O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H&H	11B	JFR	1-14-81	1841-014



APPENDIX B

CHECKLIST
ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Village Two

NDI ID PA-00803

ITEM	REMARKS
AS-BUILT DRAWINGS	Not Available
REGIONAL VICINITY MAP	Refer to Figure 1, Appendix E
CONSTRUCTION HISTORY	Construction was started in 1972 and still has not been completed. The original owner, Village II at New Hope, went bankrupt and the development is controlled by Citibank.
TYPICAL SECTIONS OF DAM	Refer to sheet 3, Appendix E for proposed final cross section of the dam.
OUTLETS - PLAN	Refer to sheet 3, Appendix D
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	Refer to sheet 11, Appendix D
RAINFALL/RESERVOIR RECORDS	No records kept.

Sheet 1 of 4

ITEM	REMARKS
DESIGN REPORTS	Report Upon the Application by DER is the only design report available.
GEOLOGY REPORTS	General discussion in Report Upon the Application is the only geology report material available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None availalbe.
POST-CONSTRUCTION SURVEYS OF DAM	Construction of dam still not completed.
BORROW SOURCES	Not known.

Sheet 2 of 4

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Original construction still not completed.
HIGH POOL RECORDS	No record available.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Original construction still not completed
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Original construction still not completed.
MAINTENANCE OPERATION RECORDS	None available.

Sheet 3 of 4

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	Refer to sheets 2 and 3, Appendix E
OPERATING EQUIPMENT PLANS & DETAILS	Refer to sheet 2, Appendix E
MISCELLANEOUS	Construction of the dam is not completed and since Village Two at New Hope, Inc. is bankrupt and Citibank now controls the property it is not known if the dam will ever be completed.

Sheet 4 of 4

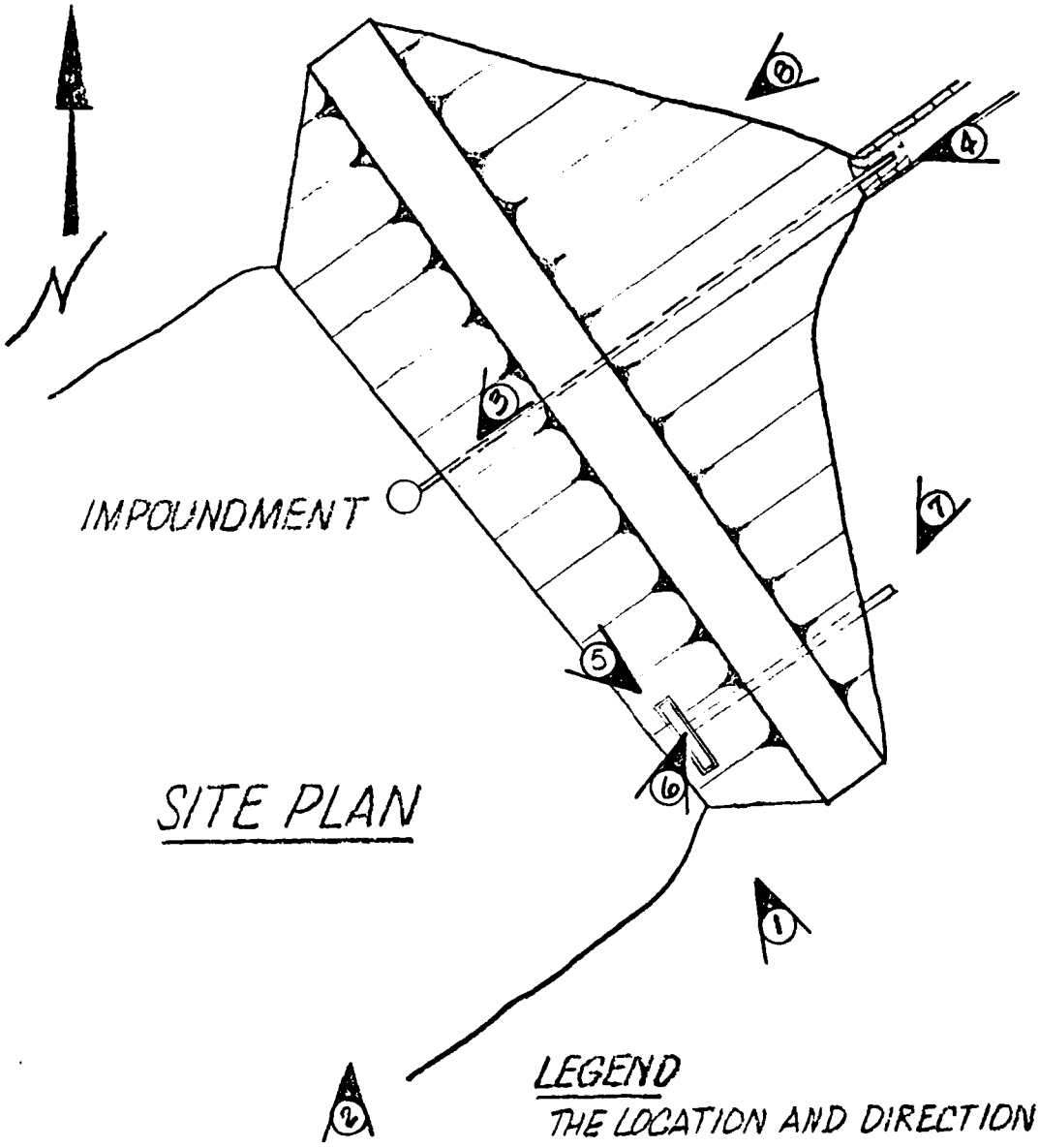
APPENDIX C

PHOTOGRAPHS

APPENDIX C
PHOTOGRAPH TABLE OF CONTENTS

O'BRIEN & GERE
ENGINEERS, INC.

SUBJECT	SHEET	BY	DATE	JOB NO
Village Two Pond Dam	A			1841-014



SITE PLAN

LEGEND

THE LOCATION AND DIRECTION IN WHICH EACH PHOTO WAS TAKEN AND THE NUMBER OF THE PHOTO

1. VIEW ALONG THE TOP OF THE DAM FROM THE RIGHT ABUTMENT. (12/15/80)

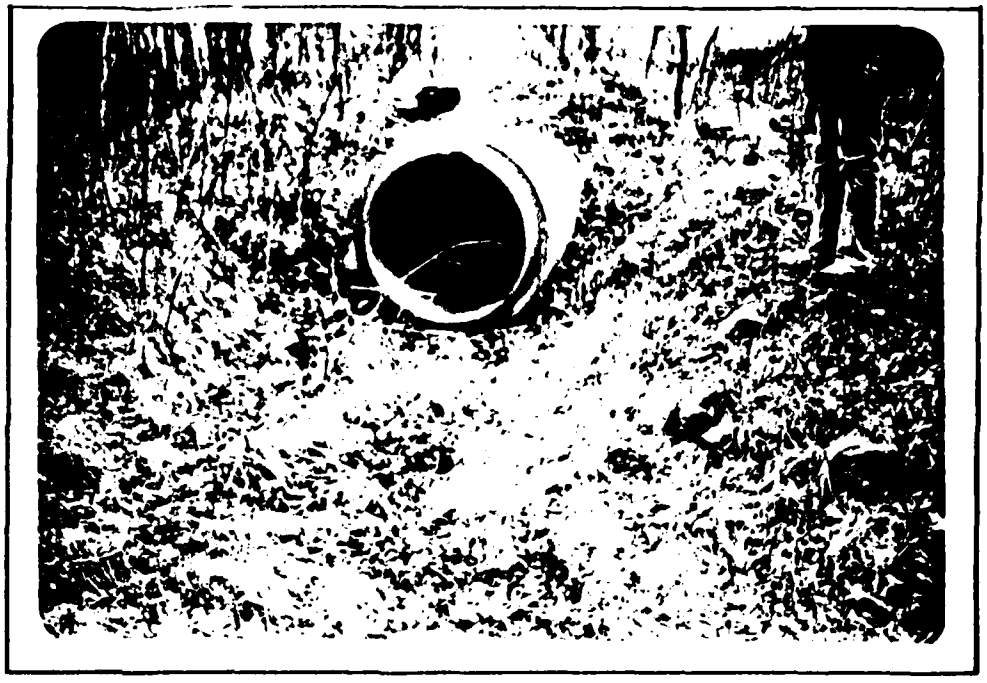
2. IMPOUNDMENT WITH DAM IN THE BACKGROUND SHOWING VARIATION IN TOP OF DAM ELEVATION. (12/15/80)

3. NORMAL OVERFLOW SPILLWAY ENTRANCE WITH STEEL ROD TRASHRACK. (12/15/80)

4. OUTLET OF 30-INCH DIAMETER NORMAL SPILLWAY PIPE. (12/15/80)

5. ENTRANCE TO EMERGENCY OVERFLOW SPILLWAY. (12/15/80)

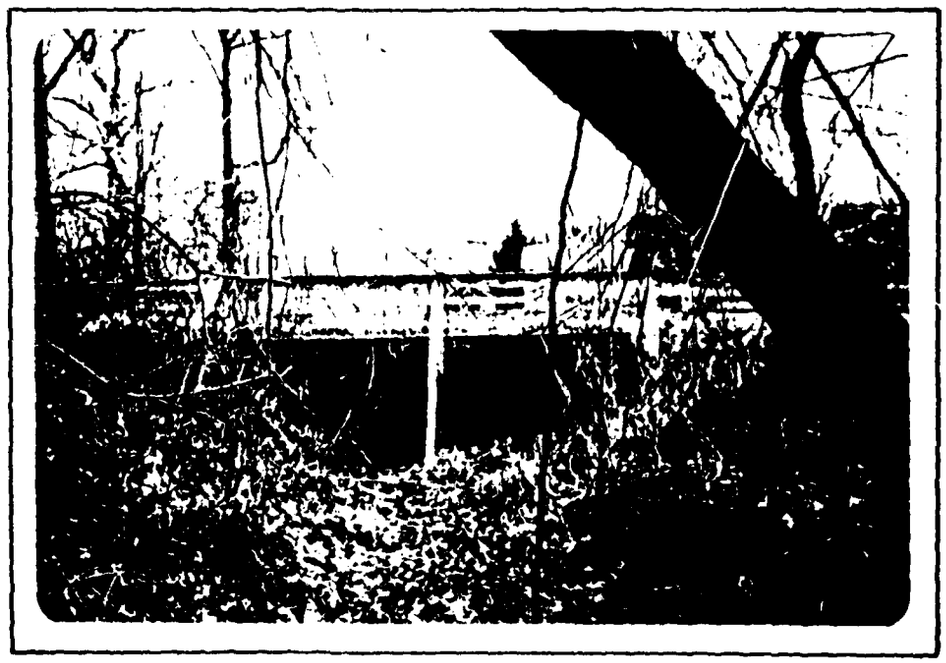
6. UPSTREAM END OF 48-INCH DIAMETER EMERGENCY SPILLWAY PIPE. (12/15/80)



7. OUTLET OF 48-INCH DIAMETER EMERGENCY SPILLWAY PIPE .(12/15/80)

8. TYPICAL SEEPAGE CONDITION AT JUNCTION OF DOWNSTREAM EMBANKMENT AND ABUTMENT. (12/15/80)

9. TYPICAL CHANNEL CONDITION DOWNSTREAM OF THE DAM.(12/15/80)



10. BRIDGE OVER CHANNEL ABOUT 1,100 FEET DOWNSTREAM OF THE DAM.(12/15/80)

11. AREA WHERE DOWNSTREAM CHANNEL ENTERS DELAWARE CANAL ABOUT 1,200 FEET DOWNSTREAM OF THE DAM.(12/15/80)

12. POTENTIAL DAMAGE AREA ABOUT 1,300 FEET DOWNSTREAM OF THE DAM ON THE EAST BANK OF THE DELAWARE CANAL.(12/15/80)

APPENDIX D

HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

VILLAGE TWO POND DAM
APPENDIX D
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

TABLE OF CONTENTS

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: RURAL, OPEN PASTURE & WOODS

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): ELEV. 164.5 (13 ACRE-FEET)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): ELEV. 167.1 (18 ACRE-FEET)

ELEVATION MAXIMUM DESIGN POOL: ELEV. 170.0

ELEVATION TOP DAM: ELEV 167.1, LOW POINT TOP OF DAM

SPILLWAY – HIGH STAGE OUTLET:

a. Elevation 166.5

b. Type BOX INLET

c. Width 12 INCHES

d. Length 40 FEET

e. Location Spillover NEAR RIGHT ABUTMENT

f. Number and Type of Gates NONE

LOW STAGE SPILLWAY

a. Type DROP INLET CLOSED CONDUIT 36"ϕ RISER PIPE WITH 30"ϕ OUTLET PIPE

b. Location NEAR CENTER OF DAM

c. Entrance inverts ELEV 164.5 (WITH STEEL ROD TRASH RACK)

d. Exit inverts ELEV. 133.0

e. Emergency draindown facilities 8"ϕ DRAIN PIPE

HYDROMETEOROLOGICAL GAGES:

a. Type NONE WITHIN WATERSHED

b. Location N/A

c. Records N/A

MAXIMUM NON-DAMAGING DISCHARGE: NOT DETERMINED

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspectic Program. The "Flood Hydrograph Package (HEC-1), Dam Safe y Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputed and flows are routed downstream to the damage center and a dam breach analysis is performed 1/

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out.

1/ "High" hazard structures only

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H; H	3	JFR ✓ JB	1/13/81 1/20/81	1841-014

HYDROLOGY CALCULATIONS

DRAINAGE AREA (PLANIMETERED FROM USGS QUAD SHEET): 0.14 SQ. MI.

STAGE - STORAGE DATA *

ELEVATION	AREA (ACRES)	STORAGE (AC. FT.)
140	0	0
150	0.2	0.7
160	1.2	7.0
170	3.2	28.2
175	5.8	50.4
180	7.5	83.5

PMP CALCULATIONS (HMR 33)

AREA IS IN ZONE 6

24-HOUR, 200 SQ. MI. RAINFALL = 23.5 INCHES

HR.	%	RAINFALL
6	113	26.6"
12	123	28.9"
24	132	31.0"
48	142	33.4"

* $\text{STORAGE} = \frac{H}{3}\left(A_1 + A_2 + \sqrt{A_1 A_2}\right)$

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H, H	4	JFR JFR	1/13/81 1/20/81	1841-014

SNYDER COEFFICIENTS

INFORMATION PROVIDED BY BALTIMORE C.O.E.

AREA IS IN ZONE 4B

$\therefore \quad C_p = 0.43 \quad , \quad C_t = 0.60$

$T_p = C_t (L \cdot L_{CA})^{0.3}$

$L \simeq 0.70$ MILES , $L_{CA} \simeq 0.32$ MILES

$T_p = 0.60 (0.70 \times 0.32)^{0.3} = 0.38$ HOURS

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H&H	5	JFR	1-7-81	1841-014
		JFR	1/20/81	

ELEVATION - DISCHARGE CALCULATIONS

NORMAL OVERFLOW STRUCTURE - Shaft spillway

WEIR CONTROL

$$Q = C_w L H^{3/2}$$

Assume $C_w = 3.0$

$$L = \pi D = \pi (3) = 9.42'$$

$$Q = (3.0)(9.42) H^{3/2} = 28.3 H^{3/2}$$

CULVERT CONTROL - Inlet submerged

$$Q = A \sqrt{\frac{2gH}{1 + K_e + f(L/D)}}$$; Applied Hydraulics in Engineering, Morris and Wiggert, 1972, pp. 289.

Assume $K_e = 1$ & $n = 0.01$ for welded steel pipe

$$\therefore f = \frac{185 n^2}{d^{1/3}} = \frac{185 (.01)^2}{(2.5)^{1/3}} = 0.014$$

$$Q = \frac{\pi (2.5)^2}{4} \sqrt{\frac{(32.2) H}{1 + 1 + .014 (208/2.5)}}$$

$$Q = 22.1 H^{1/2}$$

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H & H	6	JFR	1/8/81	1841-014

✓ 1/20/81

ELEVATION - DISCHARGE DATA FOR NORMAL OVERFLOW STRUCTURE

W.S.E.	WEIR H_w	WEIR Q [1]	CULVERT H_c	CULVERT Q [2]	SPILLWAY OUTFLOW
164.5	0	0	30.25	122	0
166.5	2	80	32.25	126	80
168.0	3.5	185	33.75	128	128
169.0	4.5		34.75	130	130
170.0	5.5		35.75	132	132
171.0	6.5		36.75	134	134
172.0	7.5		37.75	136	136
173.0	8.5		38.75	138	138
174.0	9.5		39.75	139	139
175.0	10.5		40.75	141	141

[1] $Q_w = 28.3 H_w^{3/2}$

[2] $Q_c = 22.1 H_c^{1/2}$

Where H_w is the height of the reservoir water surface above the top of the riser pipe and H_c is the height of the reservoir water surface above the center line of the outlet conduit.

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H & H	7	JFR rev	1-8-81 1/20/81	1841-014

EMERGENCY OVERFLOW STRUCTURE

WEIR CONTROL

$Q = C_w \cdot L \cdot H^{3/2}$

Assume $C_w = 3.0$

$Q = 3.0(40)H^{3/2} = 120\,H^{3/2}$

CULVERT CONTROL

Reference: Bureau of Public Roads, "Headwater Depth For Concrete Pipe Culverts with Inlet Control" (Nomograph), Jan. 1963. (Refer to Sh

ELEV. - DISCHARGE DATA FOR EMERGENCY OVERFLOW STR.

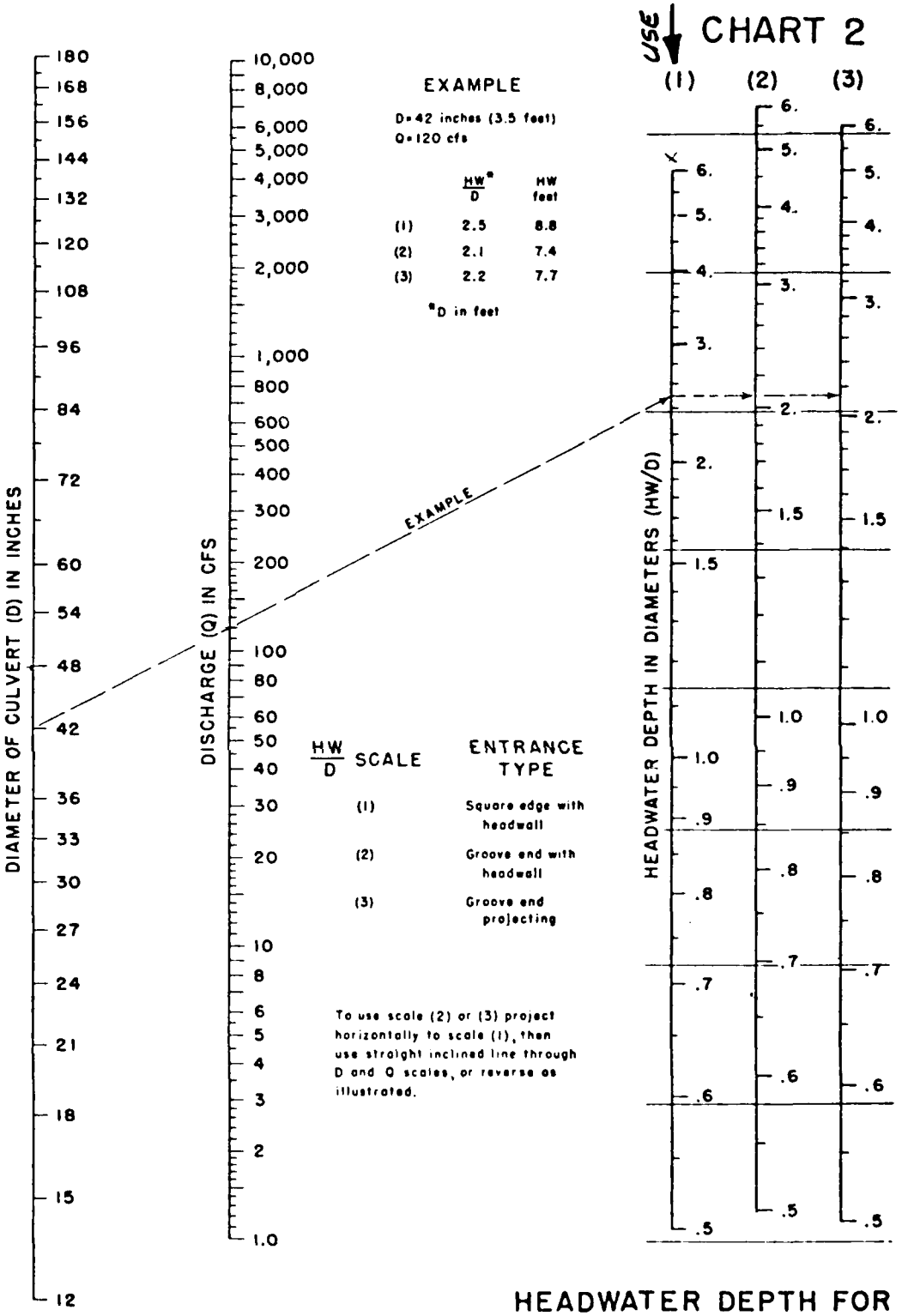
	WEIR		CULVERT		
W.S. EL.	H*	Q	HW**	Q	SPILLWAY OUTFLOW
166.5	0	0	5	—	0
167.5	1.0	120	6	110	110
168.0	1.5	147	6.5	120	120
169.0	2.5		7.5	135	135
170.0	3.5		8.5	150	150
171.0	4.5		9.5	160	160
172.0	5.5		10.5	170	170
173.0	6.5		11.5	185	185
174.0	7.5		12.5	195	195
175.0	8.5		13.5	205	205

*H = Height of the reservoir water surface above the weir crest.

**HW = headwater = height of reservoir surface above the outlet pipe invert.

Sh 8

Job No 1641-014



HEADWATER DEPTH FOR CONCRETE PIPE CULVERTS WITH INLET CONTROL

HEADWATER SCALES 2&3
REVISED MAY 1964

BUREAU OF PUBLIC ROADS JAN 1963

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H & H	9	JFR	1/9/81	1841-014

VJR 1/20/81

DISCHARGE OVER TOP OF DAM - ELEV. 167.1

$Q = C_w L H^{3/2}$

Where H is measured at 5/6 the actual water surface elevation above the dam. (Refer SCS, NEH-4, Ch 14, Pg 46)

Assume $C_w = 2.7$

$Q = 2.7(35)(1)^{1.5} = 95$ cfs @ ELEV. 1168

$Q = 2.7(85)(2)^{1.5} = 649$ cfs @ ELEV. 169

$Q = 2.7(120)(3)^{1.5} = 1684$ cfs @ ELEV. 170

$Q = 2.7(155)(4)^{1.5} = 3348$ cfs @ ELEV. 171

$Q = 2.7(185)(5)^{1.5} = 5585$ cfs @ ELEV. 172

$Q = 2.7(210)(6)^{1.5} = 8333$ cfs @ ELEV. 173

$Q = 2.7(230)(7)^{1.5} = 11,501$ cfs @ ELEV. 174

$Q = 2.7(255)(8)^{1.5} = 15,579$ cfs @ ELEV. 175

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H&H	10	JFR	1/9/81	1841-014

1/20/81

COMPOSITE

ELEVATION - DISCHARGE DATA

W.S.E.	$Q_{NORMAL\ OVERFLOW}$	$Q_{EMERGENCY\ OVERFLOW}$	$Q_{OVER\ DAM}$	TOTAL OUTFLOW
164.5	0			0
166.5	80	0		80
168.0	128	120	95	343
169.0	130	135	649	914
170.0	132	150	1684	1966
171.0	134	160	3348	3642
172.0	136	170	5585	5891
173.0	138	185	8333	8656
174.0	139	195	11,501	11,835
175.0	141	205	15,579	15,925

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H&H	11	JFR	2/11/81	1841-014

STAGE - DISCHARGE DATA ASSUMING CREST OF DAM MINIMUM ELEVATION 170.0

W.S.E	Q, NORM. OUTFLOW	Q, EMERG. OUTFLOW	Q, OVER DAM *	TOTAL OUTFLOW
164.5	0			0
166.5	80	0		80
168	128	120		248
170	132	150	0	282
171	134	160	467	761
173	138	185	3157	3480
175	141	205	8181	8527

* Computations

$Q = 2.7\,(173)(171-170)^{3/2} = 467$ cfs @ ELEV. 171

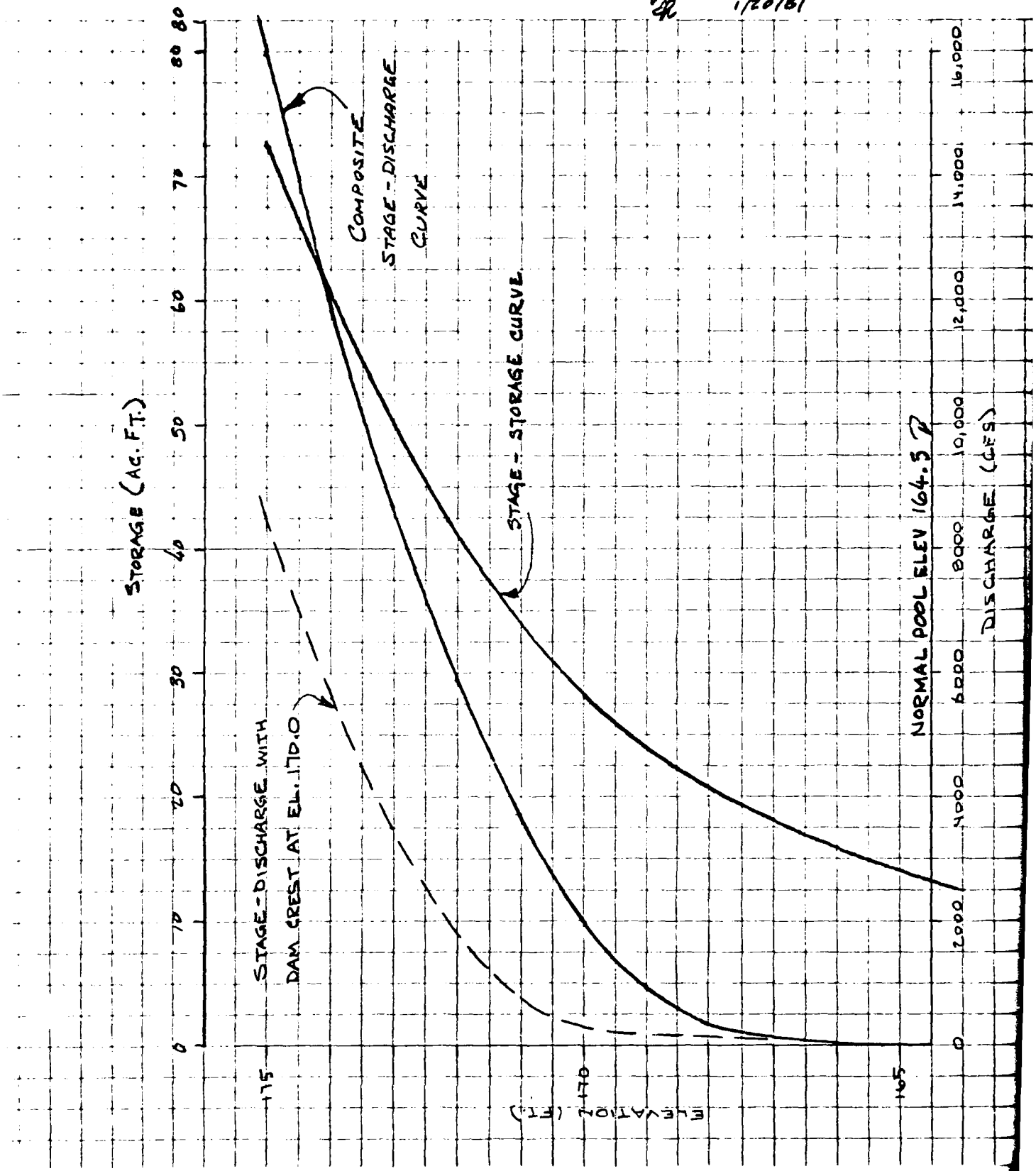
$Q = 2.7\,(225)(173-170)^{3/2} = 3157$ cfs @ ELEV. 173

$Q = 2.7\,(271)(175-170)^{3/2} = 8181$ cfs @ ELEV. 175

O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H & H	12	JFR	1/14/81	1841-014

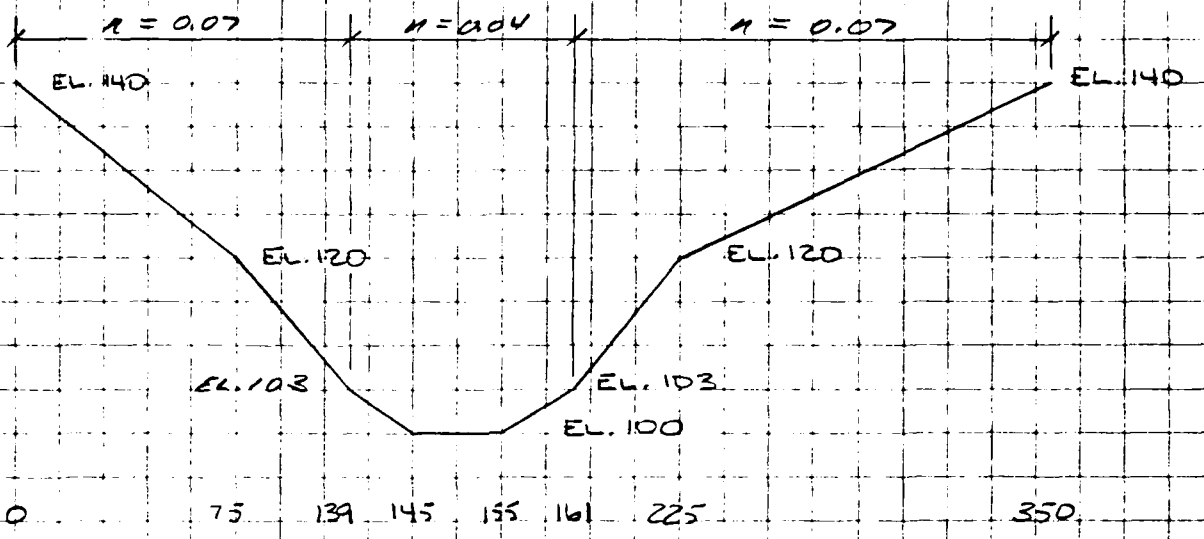
1/20/81



O'BRIEN & GERE

SUBJECT	SHEET	BY	DATE	JOB NO
VILLAGE 2 - H & H	13	JFR	1/19/81	1841-014
		JFR	1/20/81	

DOWNSTREAM CHANNEL SECTION



REACH LENGTH = 850'

Δ ELEV = 135 - 100 = 35'

$$\text{SLOPE} = \frac{35}{850} = 0.04 \frac{\text{FT}}{\text{FT}}$$

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1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********
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     1                A1
     2                A2
     3                A3
     4                B     300        0       10        0        0        0        0        0       -4        0
     5                B1      5
     6                J       1        9        1
     7                J1     .1       .2       .3       .4       .5       .6       .7       .8      1.0
     8                K       0   INFLOW        0        0        0        0        1
     9                K1
    10                M       1        1      .14        0      .14        0        0        1
    11                P       0     23.5      113      123      132      142
    12                T                                                    1.0      .05
    13                W     .38      .43
    14                X    -1.5     -0.1        2
    15                K       1   OUTFLO        0        0        0        0        1
    16                K1
    17                Y                                   1        1
    18                Y1      1                                                -164.5       -1
    19                Y4  164.5    166.5      168      169      170      171      172      173      174      175
    20                Y5      0       80      343      914     1966     3642     5891     8656    11835    15925
    21                $A      0       .2      1.2      3.2      5.8      7.5
    22                $E    140      150      160      170      175      180
    23                $$  164.5
    24                $D  167.1
    25                K      99
```

HYDROLOGIC ANALYSIS OF VILLAGE TWO DAM
NATIONAL DAM SAFETY PROGRAM
BALTIMORE DIVISION - CORPS OF ENGINEERS

INFLOW TO VILLAGE TWO POND

ROUTED OUTFLOW FROM VILLAGE TWO DAM

1 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT INFLOW
ROUTE HYDROGRAPH TO OUTFLO
END OF NETWORK

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1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********
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RUN DATE* 81/02/12.
TIME* 12.15.52.

HYDROLOGIC ANALYSIS OF VILLAGE TWO DAM
NATIONAL DAM SAFETY PROGRAM
BALTIMORE DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS=	.10	.20	.30	.40	.50	.60	.70	.80	1.00

SHEET 14

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO VILLAGE TWO POND

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFLOW		0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.14	0.00	.14	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.50	113.00	123.00	132.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= .38 CP= .43 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 23 END-OF-PERIOD ORDINATES, LAG= .38 HOURS, CP= .43 VOL= 1.00

27.	80.	96.	76.	59.	46.	36.	28.	21.	17.
13.	10.	8.	6.	5.	4.	3.	2.	2.	1.
1.	1.	1.							

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.70	24.29	2.40	13558.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM VILLAGE TWO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUTFLO	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-165.	-1

STAGE	164.50	166.50	168.00	169.00	170.00	171.00	172.00	173.00	174.00	175.00
FLOW	0.00	80.00	343.00	914.00	1966.00	3642.00	5891.00	8656.00	11835.00	15925.00
SURFACE AREA=	0.	0.	1.	3.	6.	8.				
CAPACITY=	0.	1.	7.	28.	50.	84.				
ELEVATION=	140.	150.	160.	170.	175.	180.				

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
164.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
167.1	0.0	0.0	0.

PEAK OUTFLOW IS 51. AT TIME 40.50 HOURS

PEAK OUTFLOW IS 119. AT TIME 40.33 HOURS

PEAK OUTFLOW IS 194. AT TIME 40.17 HOURS

PEAK OUTFLOW IS 258. AT TIME 40.17 HOURS

PEAK OUTFLOW IS 322. AT TIME 40.17 HOURS

PEAK OUTFLOW IS 408. AT TIME 40.17 HOURS

PEAK OUTFLOW IS 487. AT TIME 40.00 HOURS

PEAK OUTFLOW IS 562. AT TIME 40.00 HOURS

PEAK OUTFLOW IS 688. AT TIME 40.00 HOURS

********** ********** ********** ********** **********

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50	RATIO 6 .60	RATIO 7 .70	RATIO 8 .80	RATIO 9 1.00
HYDROGRAPH AT	INFLOW	.14	1	70.	141.	211.	282.	352.	422.	493.	563.	704.
		(.36)		(1.99)(	3.99)(	5.98)(	7.97)(	9.97)(	11.96)(	13.96)(	15.95)(	19.94)
ROUTED TO	OUTFLO	.14	1	51.	119.	194.	258.	322.	408.	487.	562.	688.
		(.36)		(1.43)(	3.37)(	5.49)(	7.32)(	9.12)(	11.54)(	13.79)(	15.90)(	19.49)

I

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	164.50	164.50	167.10
STORAGE	14.	14.	20.
OUTFLOW	0.	0.	185.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	165.77	0.00	17.	51.	0.00	40.50	0.00
.20	166.72	0.00	19.	119.	0.00	40.33	0.00
.30	167.15	.05	20.	194.	.17	40.17	0.00
.40	167.52	.42	21.	258.	1.00	40.17	0.00
.50	167.88	.78	22.	322.	1.50	40.17	0.00
.60	168.11	1.01	23.	408.	2.00	40.17	0.00
.70	168.25	1.15	23.	487.	2.67	40.00	0.00
.80	168.38	1.28	23.	562.	3.67	40.00	0.00
1.00	168.60	1.50	24.	688.	4.83	40.00	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80

SHEET 17

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1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
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     1                A1                        HYDROLOGIC ANALYSIS OF VILLAGE TWO DAM
     2                A2                             NATIONAL DAM SAFETY PROGRAM
     3                A3                        BALTIMORE DIVISION - CORPS OF ENGINEERS
     4                B    300        0        10        0        0        0        0        0       -4        0
     5                B1     5
     6                J      2        1         1
     7                J1   .50
     8                K      0   INFLOW         0        0        0        0        1
     9                K1                                 INFLOW TO VILLAGE TWO POND
    10                M      1        1       .14        0      .14        0        0        0        1
    11                P      0     23.5       113      123      132      142
    12                T                                                    1.0      .05
    13                W    .38      .43
    14                X   -1.5     -0.1         2
    15                K      1   OUTFLO         0        0        0        0        1
    16                K1                          ROUTED OUTFLOW FROM VILLAGE TWO DAM
    17                Y                                   1        1
    18                Y1     1                                                 -164.5       -1
    19                Y4 164.5    166.5       168      169      170      171      172      173      174      175
    20                Y5     0       80       343      914     1966     3642     5891     8656    11835    15925
    21                $A     0       .2       1.2      3.2      5.8      7.5
    22                $E   140      150       160      170      175      180
    23                $$ 164.5
    24                $B 167.1
    25                $B   150        1       140        2   164.5    167.8
    26                $R   150        1       140        2   164.5      175
    27                K      1   BREACH                                            1
    28                K1                            ROUTING DOWNSTREAM TO HAZARD AREA
    29                Y                                   1        1
    30                Y1     1                                                           -1
    31                Y6   .07      .04       .07      100      120      850      .04
    32                Y7     0      140        75      120      139      103      145      100      155      100
    33                Y7   161      103       225      120      350      140
    34                K     99
1                                PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                      RUNOFF HYDROGRAPH AT      INFLOW
                                      ROUTE HYDROGRAPH TO       OUTFLO
                                      ROUTE HYDROGRAPH TO       BREACH
                                      END OF NETWORK
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1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********

 RUN  DATE= 81/02/13.
      TIME= 07.45.34.
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HYDROLOGIC ANALYSIS OF VILLAGE TWO DAM
NATIONAL DAM SAFETY PROGRAM
BALTIMORE DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 2 NRTIO= 1 LRTIO= 1

RTIOS= .50

SHEET 18

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO VILLAGE TWO POND

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFLOW		0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.14	0.00	.14	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.50	113.00	123.00	132.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .500

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= .38 CP= .43 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 23 END-OF-PERIOD ORDINATES, LAG= .38 HOURS, CP= .43 VOL= 1.00

27.	80.	96.	76.	59.	46.	36.	28.	21.	17.
13.	10.	8.	6.	5.	4.	3.	2.	2.	1.
1.	1.	1.							

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.70	24.29	2.40	13558.
										(678.)(	617.)(	61.)(	383.92)

SHEET 19

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM VILLAGE TWO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUTFLO	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-165.	-1

STAGE	164.50	166.50	168.00	169.00	170.00	171.00	172.00	173.00	174.00	175.00
FLOW	0.00	80.00	343.00	914.00	1966.00	3642.00	5891.00	8656.00	11835.00	15925.00
SURFACE AREA=	0.	0.	1.	3.	6.	8.				
CAPACITY=	0.	1.	7.	28.	50.	84.				
ELEVATION=	140.	150.	160.	170.	175.	180.				

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
164.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
167.1	0.0	0.0	0.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
150.	1.00	140.00	2.00	164.50	167.80

BEGIN DAM FAILURE AT 40.17 HOURS

PEAK OUTFLOW IS 645. AT TIME 40.58 HOURS

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
150.	1.00	140.00	2.00	164.50	175.00

PEAK OUTFLOW IS 322. AT TIME 40.17 HOURS

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING DOWNSTREAM TO HAZARD AREA

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BREACH	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0400	.0700	100.0	120.0	850.	.04000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 140.00 75.00 120.00 139.00 103.00 145.00 100.00 155.00 100.00
161.00 103.00 225.00 120.00 350.00 140.00

STORAGE	0.00	.25	.58	1.01	1.56	2.28	3.17	4.21	5.42	6.79
	8.33	10.03	11.89	13.91	16.09	18.44	20.95	23.63	26.47	29.47
OUTFLOW	0.00	86.27	297.34	648.39	1220.58	1976.42	2933.66	4108.61	5516.84	7173.46
	9093.15	11290.21	13778.60	16571.98	19683.71	23126.90	26914.41	31058.88	35572.73	40468.18
STAGE	100.00	101.05	102.11	103.16	104.21	105.26	106.32	107.37	108.42	109.47
	110.53	111.58	112.63	113.68	114.74	115.79	116.84	117.89	118.95	120.00
FLOW	0.00	86.27	297.34	648.39	1220.58	1976.42	2933.66	4108.61	5516.84	7173.46
	9093.15	11290.21	13778.60	16571.98	19683.71	23126.90	26914.41	31058.88	35572.73	40468.18

MAXIMUM STAGE IS 103.1

MAXIMUM STAGE IS 102.2

SHEET 21

********** ********** ********** ********** **********

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50
HYDROGRAPH AT	INFLOW	.14	1	352.
		(.36)		(9.97)(
			2	352.
				(9.97)(
ROUTED TO	OUTFLO	.14	1	626.
		(.36)		(17.72)(
			2	322.
				(9.12)(
ROUTED TO	BREACH	.14	1	630.
		(.36)		(17.85)(
			2	323.
				(9.15)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	164.50	164.50	167.10
STORAGE	14.	14.	20.
OUTFLOW	0.	0.	185.

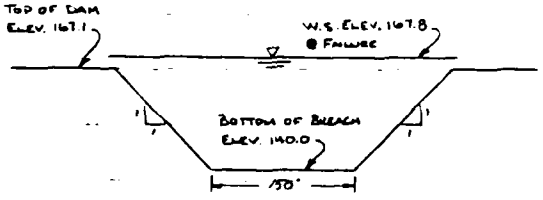
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	167.88	.78	22.	645.	.71	40.58	40.17

PLAN 2 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	164.50	164.50	167.10
STORAGE	14.	14.	20.
OUTFLOW	0.	0.	185.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	167.88	.78	22.	322.	1.50	40.17	0.00

BREACH CONFIGURATION*



PLAN 1 STATION BREACH

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	630.	103.1	40.67

PLAN 2 STATION BREACH

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.50	323.	102.2	40.17

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
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* NOTE: THE PORTION OF THE DAM ASSUMED TO BE BREACHED IS BASED ON THE GEOMETRY OF THE SITE. THE DEPTH OF FLOW OVER THE TOP OF THE DAM AT WHICH FAILURE IS INITIATED AND THE ELAPSED TIME TO COMPLETE FAILURE ARE BASED ON THE GENERAL APPEARANCE AND AGE OF THE STRUCTURE. CONSIDERATION WAS GIVEN TO THE PARAMETERS USED IN THE C.O.E. PUBLICATION "BASIC CONCEPTS OF DAM BREACH AND DEVELOPMENT OF DAM BREACH HYDROGRAPHS."

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1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********************************
     1                A1                    HYDROLOGIC ANALYSIS OF VILLAGE TWO DAM
     2                A2                        NATIONAL DAM SAFETY PROGRAM
     3                A3                    BALTIMORE DIVISION - CORPS OF ENGINEERS
     4                B    300        0      10       0       0       0       0       0      -4       0
     5                B1     5
     6                J      1        9      1
     7                J1    .1       .2      .3      .4      .5      .6      .7      .8     1.0
     8                K      0   INFLOW       0       0       0       0       1
     9                K1                          INFLOW TO VILLAGE TWO POND
    10                M      1        1      .14       0     .14       0       0       0       1
    11                P      0     23.5     113     123     132     142
    12                T                                                      1.0     .05
    13                W    .38      .43
    14                X   -1.5     -0.1       2
    15                K      1   OUTFLO       0       0       0       0       1
    16                K1                      ROUTED OUTFLOW FROM VILLAGE TWO DAM
    17                Y                               1       1
    18                Y1     1                                              -164.5      -1
    19                Y4 164.5    166.5     168     170     171     173     175
    20                Y5     0       80     248     282     761    3480    8527
    21                $A     0       .2     1.2     3.2     5.8     7.5
    22                $E   140      150     160     170     175     180
    23                $$ 164.5
    24                $D 170.0
    25                K     99
1                                 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                  RUNOFF HYDROGRAPH AT      INFLOW
                                  ROUTE HYDROGRAPH TO       OUTFLO
                                  END OF NETWORK

1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  01 APR 80
 **********************************

 RUN  DATE* 81/02/11.
      TIME* 19.03.35.

                                  HYDROLOGIC ANALYSIS OF VILLAGE TWO DAM
                                      NATIONAL DAM SAFETY PROGRAM
                                  BALTIMORE DIVISION - CORPS OF ENGINEERS

                                          JOB SPECIFICATION
                          NQ      NHR     NMIN     IDAY     IHR     IMIN    METRC     IPLT    IPRT    NSTAN
                         300        0       10        0       0        0        0        0      -4        0
                                                   JOPER     NWT   LROPT    TRACE
                                                       5       0       0        0

                                  MULTI-PLAN ANALYSES TO BE PERFORMED
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SUB-AREA RUNOFF COMPUTATION

INFLOW TO VILLAGE TWO POND

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
INFLOW		0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.14	0.00	.14	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.50	113.00	123.00	132.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= .38 CP= .43 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.10 RTIOR= 2.00

UNIT HYDROGRAPH 23 END-OF-PERIOD ORDINATES, LAG= .38 HOURS, CP= .43 VOL= 1.00

27.	80.	96.	76.	59.	46.	36.	28.	21.	17.
13.	10.	8.	6.	5.	4.	3.	2.	2.	1.
1.	1.	1.							

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	26.70	24.29	2.40	13558.
										(678.)(	617.)(	61.)(	383.92)

SHEET 24

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HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM VILLAGE TWO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUTFLO	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-165.	-1

STAGE	164.50	166.50	168.00	170.00	171.00	173.00	175.00
FLOW	0.00	80.00	248.00	282.00	761.00	3480.00	8527.00
SURFACE AREA=	0.	0.	1.	3.	6.	8.	
CAPACITY=	0.	1.	7.	28.	50.	84.	
ELEVATION=	140.	150.	160.	170.	175.	180.	

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
164.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
170.0	0.0	0.0	0.

PEAK OUTFLOW IS 51. AT TIME 40.50 HOURS

PEAK OUTFLOW IS 114. AT TIME 40.33 HOURS

PEAK OUTFLOW IS 180. AT TIME 40.33 HOURS

PEAK OUTFLOW IS 240. AT TIME 40.33 HOURS

PEAK OUTFLOW IS 262. AT TIME 40.50 HOURS

PEAK OUTFLOW IS 281. AT TIME 40.50 HOURS

PEAK OUTFLOW IS 420. AT TIME 40.33 HOURS

PEAK OUTFLOW IS 535. AT TIME 40.17 HOURS

PEAK OUTFLOW IS 671. AT TIME 40.17 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50	RATIO 6 .60	RATIO 7 .70	RATIO 8 .80	RATIO 9 1.00
HYDROGRAPH AT	INFLOW	.14	1	70.	141.	211.	282.	352.	422.	493.	563.	704.
		(.36)	(	1.99)(	3.99)(	5.98)(	7.97)(	9.97)(	11.96)(	13.96)(	15.95)(	19.94)
ROUTED TO	OUTFLO	.14	1	51.	114.	180.	240.	262.	281.	420.	535.	671.
		(.36)	(	1.43)(	3.22)(	5.09)(	6.79)(	7.42)(	7.97)(	11.89)(	15.16)(	19.00)

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	164.50	164.50	170.00
	STORAGE	14.	14.	28.
	OUTFLOW	0.	0.	282.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	165.77	0.00	17.	51.	0.00	40.50	0.00
.20	166.80	0.00	19.	114.	0.00	40.33	0.00
.30	167.39	0.00	21.	180.	0.00	40.33	0.00
.40	167.93	0.00	22.	240.	0.00	40.33	0.00
.50	168.82	0.00	25.	262.	0.00	40.50	0.00
.60	169.97	0.00	28.	281.	0.00	40.50	0.00
.70	170.29	.29	29.	420.	.83	40.33	0.00
.80	170.53	.53	30.	535.	1.33	40.17	0.00
1.00	170.81	.81	31.	671.	2.00	40.17	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
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SHEET 26

APPENDIX E

REGIONAL VICINITY MAP
&
DRAWINGS

VILLAGE TWO DAM
APPENDIX E
DRAWINGS
TABLE OF CONTENTS

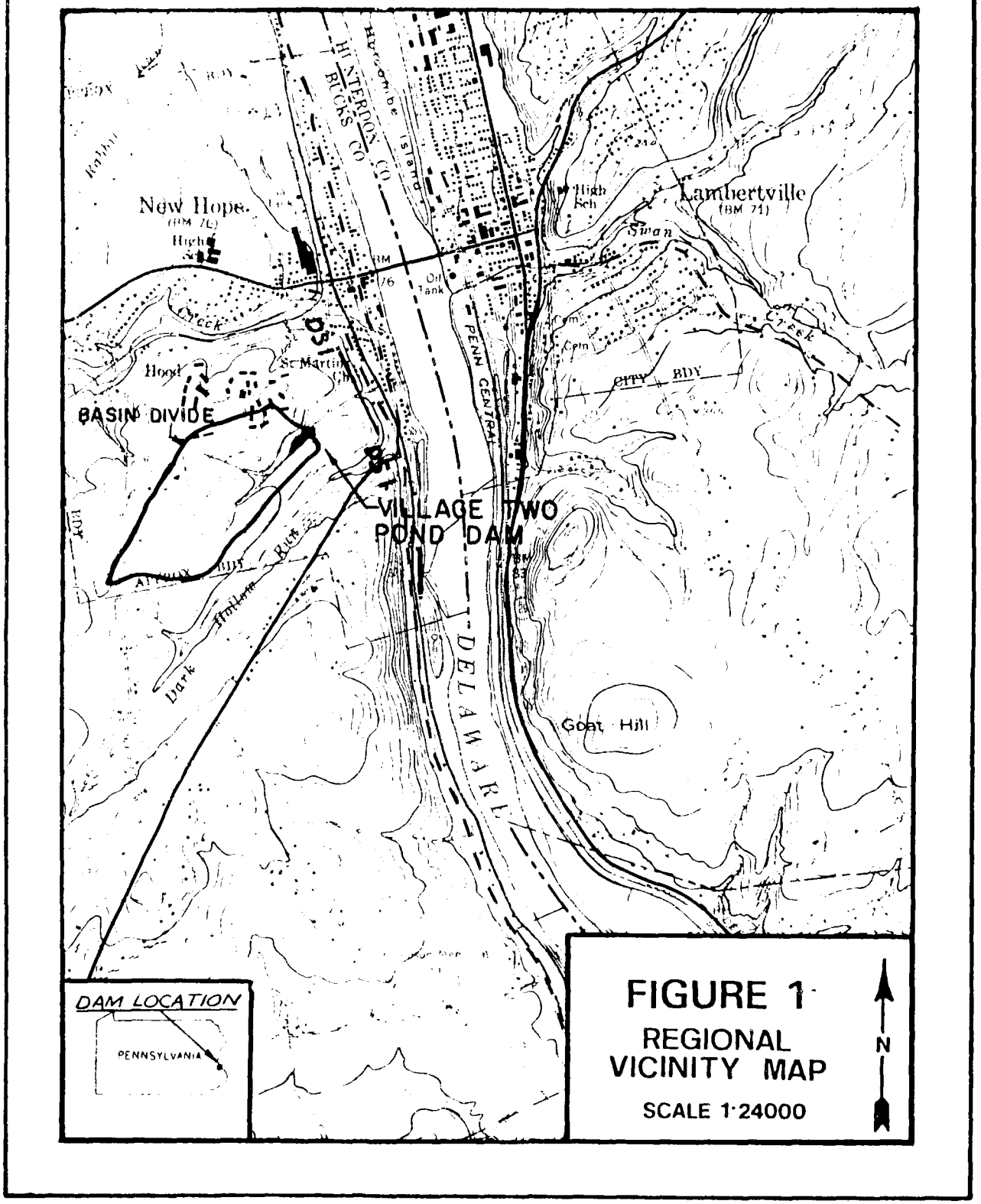
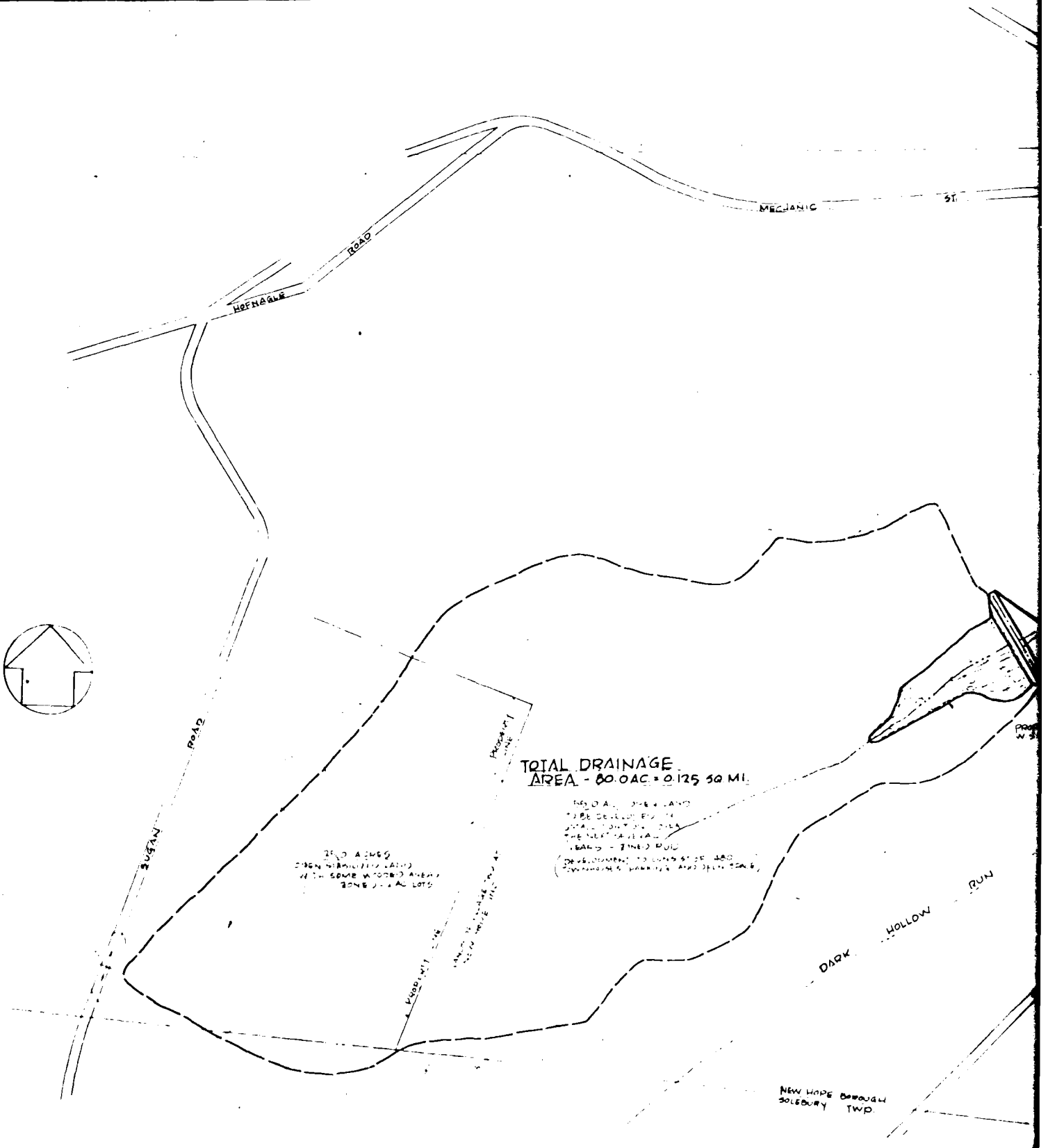


FIGURE 1

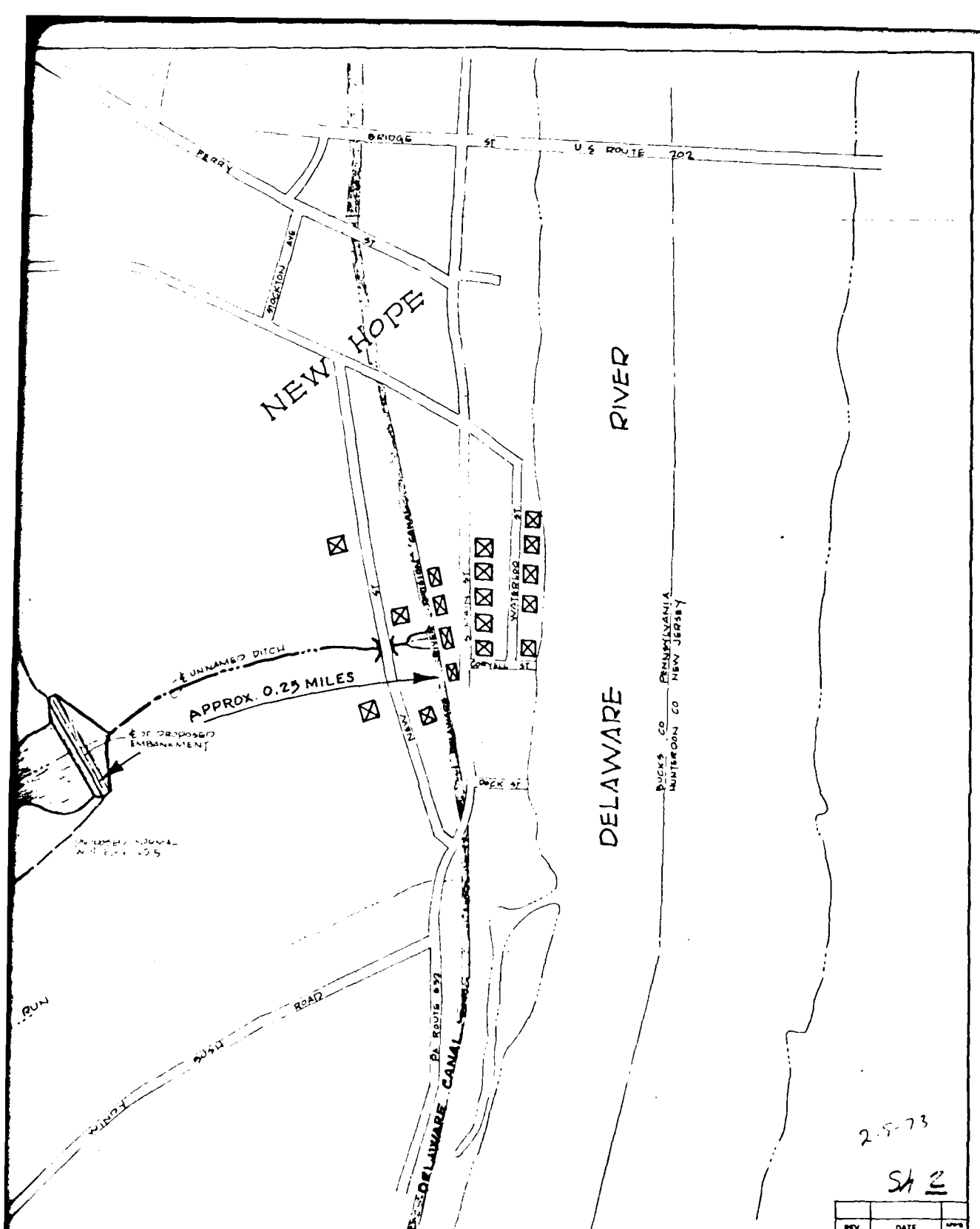
REGIONAL VICINITY MAP

SCALE 1:24000



NOTE

☒ INHABITABLE STRUCTURES WHICH COULD BE ADVERS
BREACH OF THE DAM OR A STORM APPROACHING THE



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REV	DATE	

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LOCATION AND DRAINAGE AREA PLAN
FOR PROPOSED
EARTH EMBANKMENT
FOR
VILLAGE 2 AT NEW HOPE, INC.
NEW HOPE BOROUGH, BUCKS COUNTY, PENNA.
SCALE 1" = 200' DEC 27, 1972

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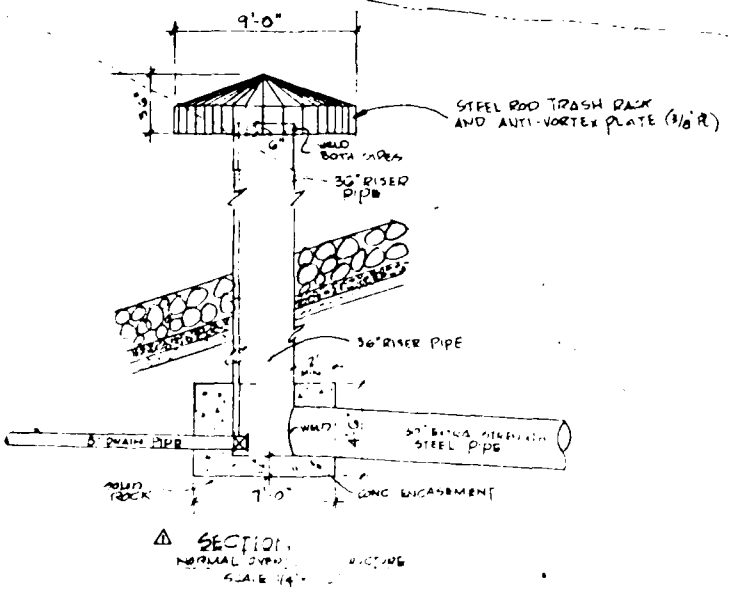
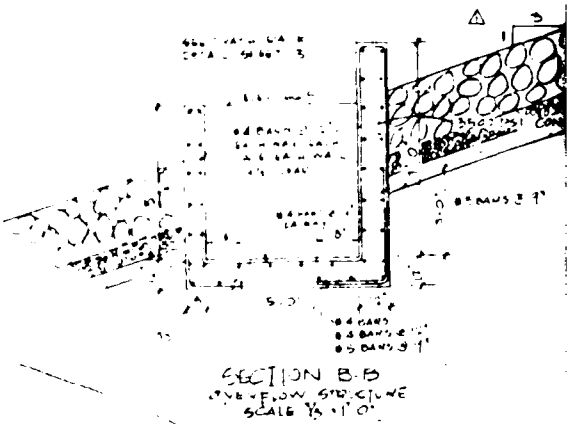
ADVERSELY AFFECTED BY A
NG THE PMF WITHOUT BREACH

THE DEER PATH

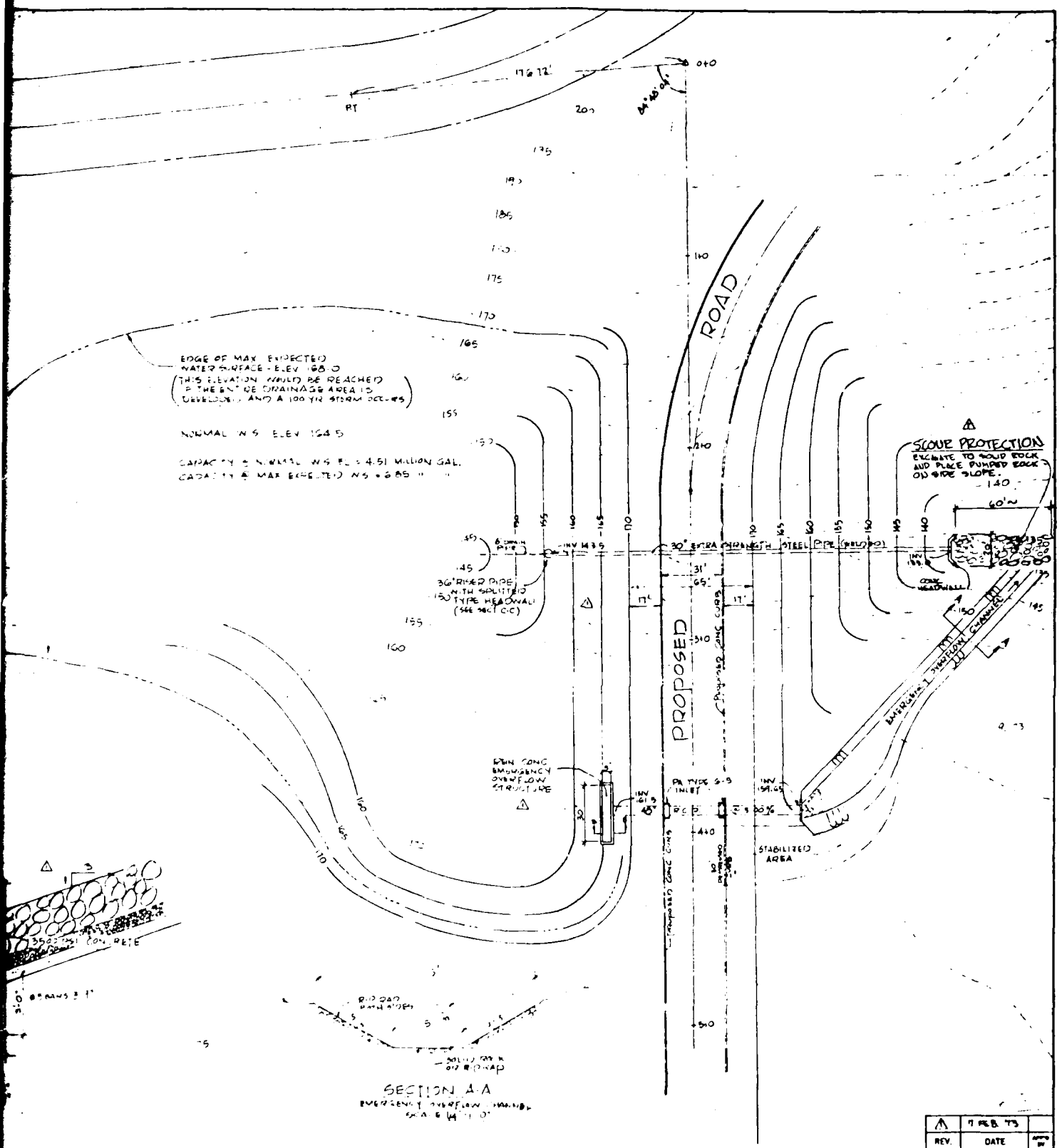


⚠ SECTION
NORMAL OVER
SCALE 1/4"



SECTION B-B
OVER-FLOW STRUCTURE
SCALE 1/4" = 1'-0"

MOSS HART WAY



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RICHARD D. GAUCH	PE 15180	SIDNEY C. LUTZ	LS 12671
HENTON & DEVRIES	PE 6998	FREDERICK C. LOSCHNER	LS 18262

DATE

GENERAL PLAN & DETAILS
OF PROPOSED
EARTH EMBANKMENT
FOR ROADWAY, STORM SEWER DETENTION, AND FOR SOIL EROSION AND SEDIMENT CONTROL
VILLAGE 2 AT NEW HOPE, INC
NEW HOPE BOROUGH, BUCKS COUNTY, PENNA.

SCALE - 1" = 30' DEC 27, 1972

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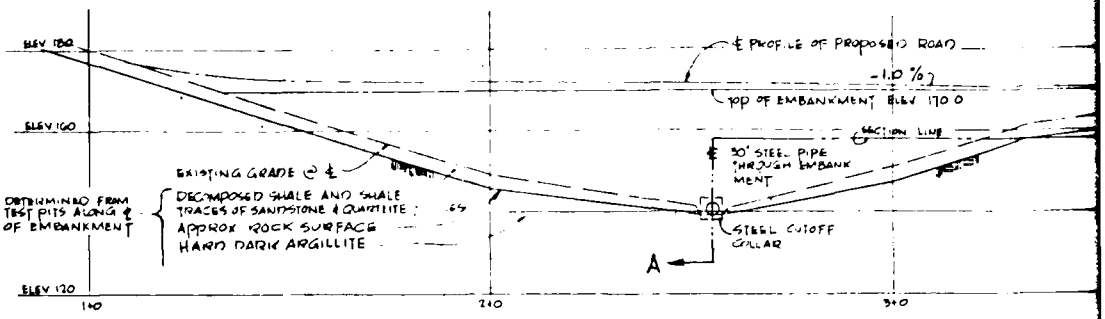
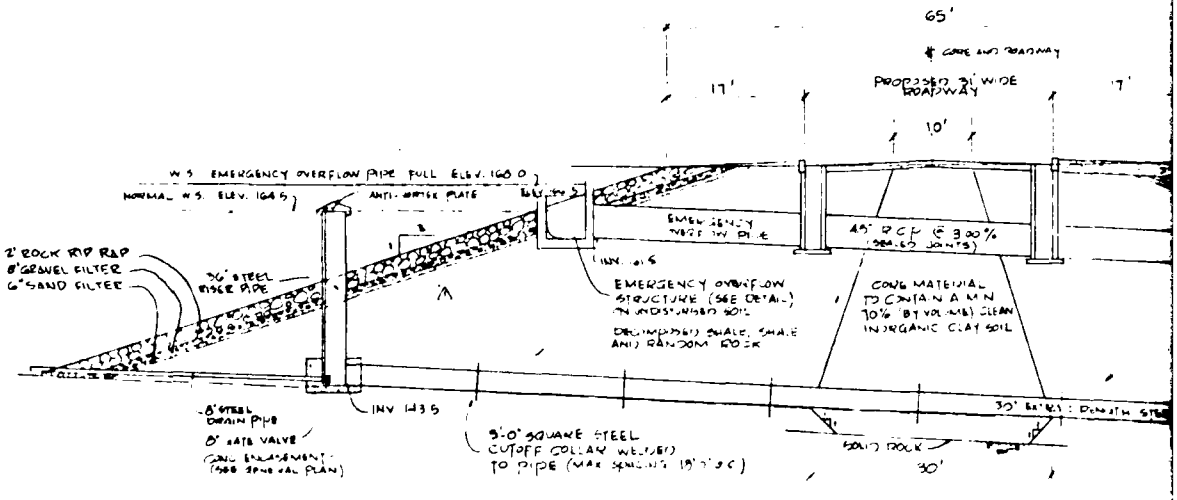
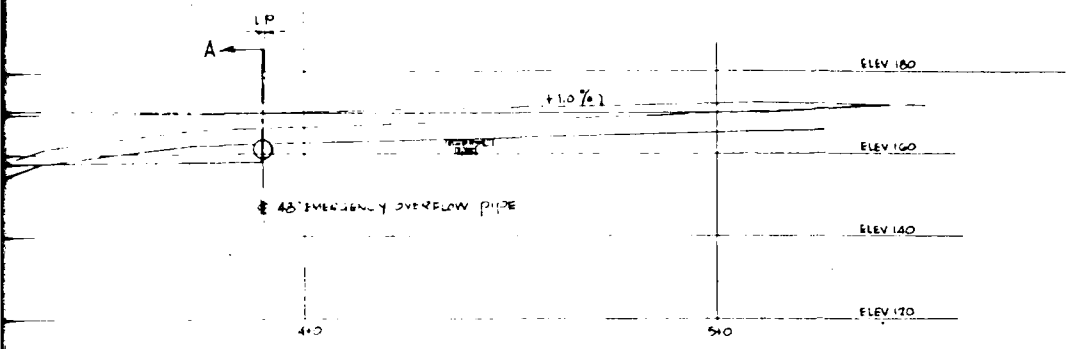
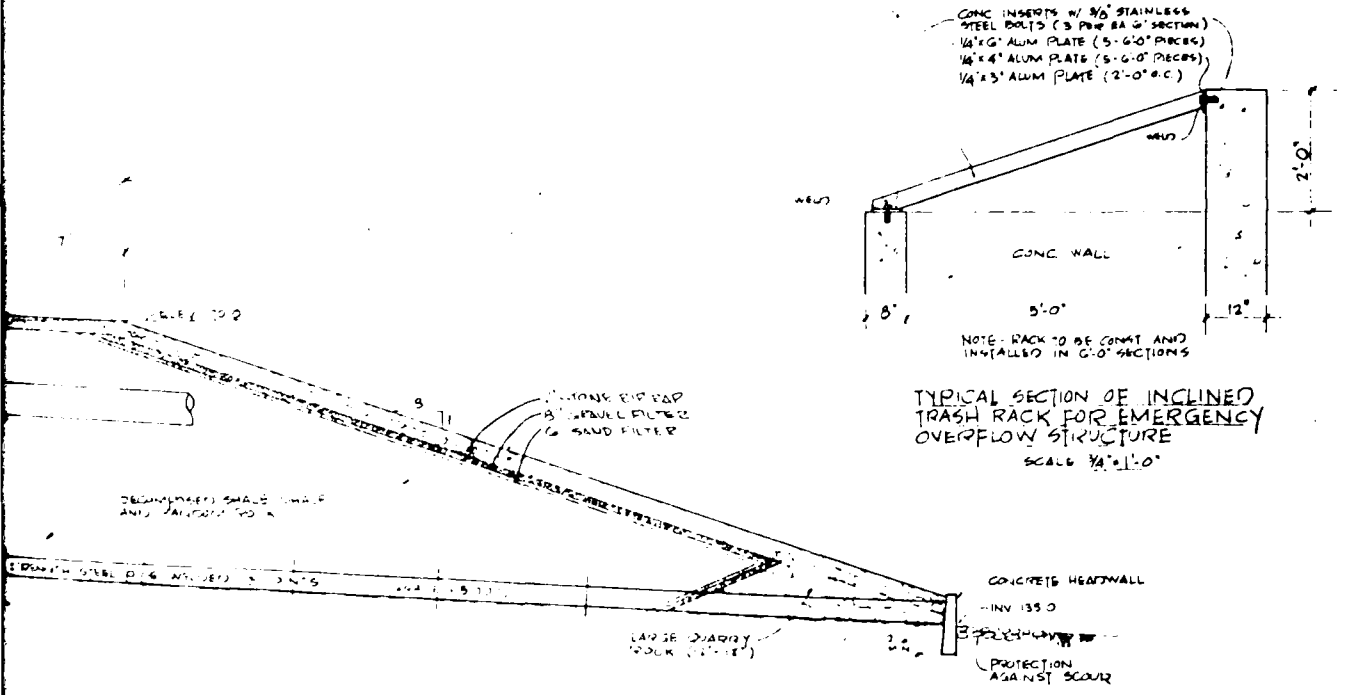


LONGITUDINAL SECTION OF PROPOSED EMBANKMENT
SCALE 1" = 20'



SECTION A-A
SCALE 1" = 10'





TYPICAL SECTION OF INCLINED TRASH RACK FOR EMERGENCY OVERFLOW STRUCTURE

SCALE 3/4"=1'-0"

sh 4

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LONGITUDINAL SECTION & TYPICAL SECTION OF PROPOSED EARTH EMBANKMENT FOR VILLAGE 2 AT NEW HOPE, INC.

NEW HOPE BOROUGH, BUCKS COUNTY, PENNA.

SCALE AS SHOWN DEC 27, 1972

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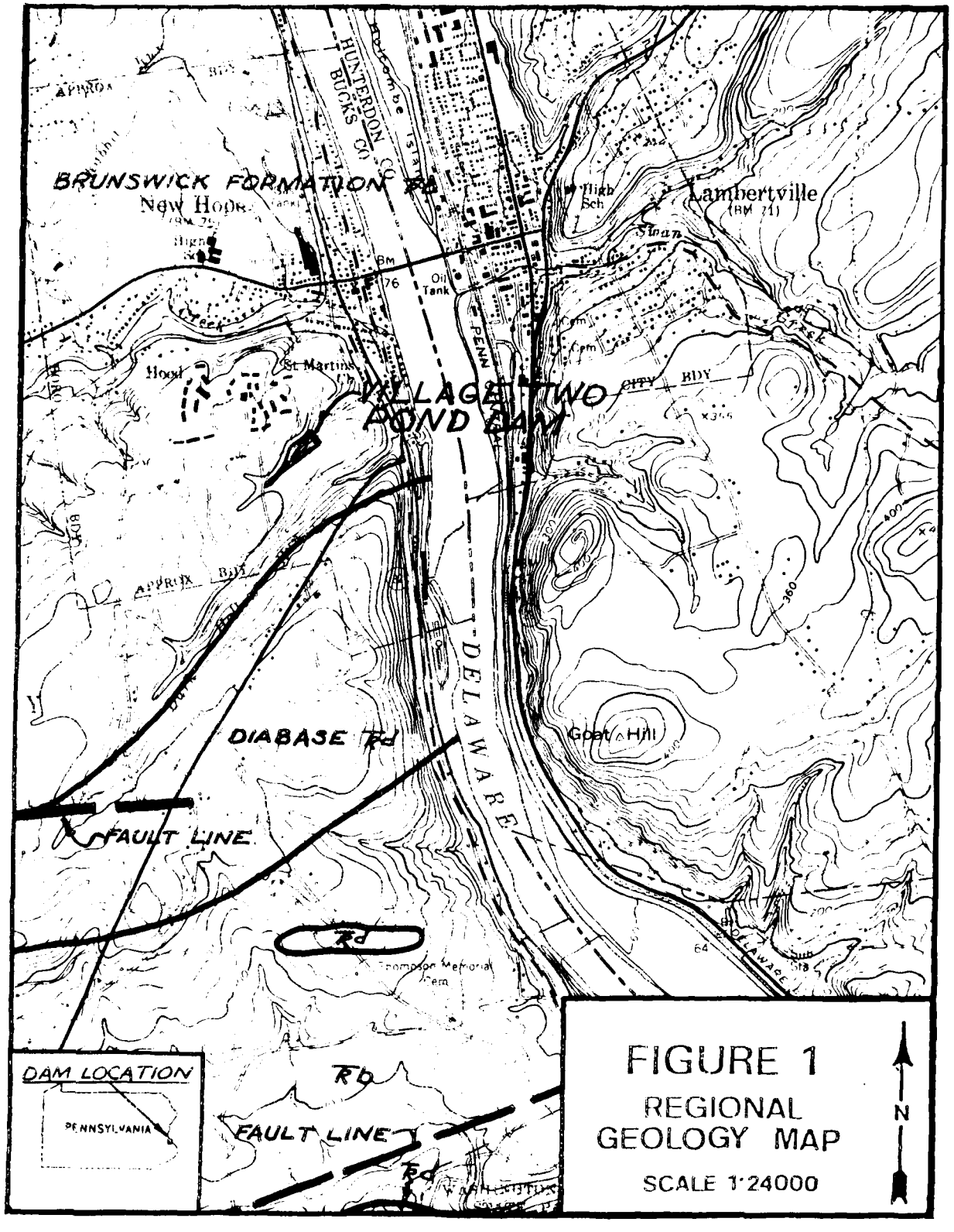
APPENDIX F

GEOLOGY

SITE GEOLOGY

VILLAGE TWO POND DAM

Village Two Pond Dam is located in the Lowland section of the Piedmont Physiographic Province. As shown in Figure 1, the damsite and surrounding region is underlain by Brunswick Lithofacies of the Triassic age. The Brunswick Lithofacies are lithologically the most uniform of the three major sedimentary units of the Newark Group in Bucks County. The rock is a weak bright-red argillaceous shale that readily crumbles into thin flakes or ragged fragments. Bedding is wavy and irregular, ripple marks are found at many places and mud cracks are common. The Brunswick Lithofacies are much more easily eroded than the underlying Lockatong agrillite or the intruding diabase. It, therefore, forms a low, gently rolling terraine with shallow valleys and low ridges parallel to the strike of the beds.


BRUNSWICK FORMATION Rd
HUNTERDON CO
BUCKS CO
New Hope
Lambertville
(BM 71)
High Sch
Swan
Bm 76
Oil Tank
PENN
Creek
Hood
St Martins
VILLAGE TWO POND DAM
CITY BDY
APPROX BDY
DIABASE Rd
DELAWARE
Goat Hill
FAULT LINE
Rd
Thompson Memorial Park
DAM LOCATION
PENNSYLVANIA
FAULT LINE
Rd
FIGURE 1
REGIONAL GEOLOGY MAP
SCALE 1:24000
N


DA
FILM